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Correspondence.—Wishing to make this JOURNAL a gazette of intelligent discussion to those of our readers who may wish to gain or give information on the subjects to which its columns are devoted, correspondence is solicited for publication from all who make the study of those subjects a pleasure or a profession.

The Public Lighting Tables of the American Meter Company will be found in the page advertisement of that Company.

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[NOTICE.]

Wrinkle Department, The American Gas Institute.

To the Membership, American Gas Institute: All members of The American Gas Institute, and others interested, are requested to contribute a description of any novel device or scheme covering any feature of the gas business. Every department of every Company uses some novel stunt which would be of value to others. The object of this department is to compile such information. The value of the report depends entirely on the co-operation received. Send in your contribution at once to

MILAN R. BUMP, Editor,
60 Wall street, New York.

BRIEFLY TOLD.

ILLUMINATING ENGINEERING SOCIETY, NEW YORK SECTION.—The June meeting of this Society was held the evening of last Friday, in the Edison Auditorium, 44 West 27th street. As usual the attendance was good and the proceedings were animated and instructive. The number of the evening was an excellent paper by Mr. George C. Keech, on "Industrial Plant Illumination," which was interesting from many points, and it brought on a spirited discussion. The various types of mercury vapor, inclosed arc and metallized filament carbon incandescent lamps were explained and debated in a most instructive way. The annual meeting of the Society is to be held in Boston the last days of July, and, judging from the enthusiasm expressed at the June session of the New York Section, the sessions will be of exceeding value and interest.

A CORRECTION.—Referring to the article on "Interior Illumination, with Special Reference to the Meeting Room," as the same was given in our issue for last week (page 979), the author, Mr. T. J. Litle, calls our attention to these points. The third illustration is shown at the wrong angle, whereas in the preceding figure the curve is in the proper, or vertical position. The idea of the angle-shade is to reflect the light below the horizontal, at the same time protecting the eyes of those assembled in the meeting room who happen to be at the back of the light. Mr. Litle continues: This error would be immaterial with an ordinary appliance, but as the one under notice is of a type which the Welsbach Company is just placing on the market it was feared some readers might get the impression that the burner could be used at the angle shown, which would be impossible, for the excellent reason that the glassware could not stand the strain.

PERSONAL.—Mr. West Bissell, who ranks as Assistant Engineer in the Hudson Division of the Gas Department of the Public Service Corporation of New Jersey, has resigned from that post, the resignation to date from the 1st prox. Unfortunately, his resignation was occasioned by the necessity of 3 or 4 months' rest, during which period he will take treatment for an ailment that has bothered him for some time. However, we are glad to add that there is no doubt that in due period he will return to the field of duty on the paths whereof he walked actively and well.

A WARRANT AS TO GOOD VALUES FOR GOOD SHARES.—That a good thing will always bring a good price was again well exemplified in the recent sale at auction of 6,000 shares of the new stock authorized some time ago by the management of that excellently well managed corporation, the Consumers Gas Company, of Toronto, Ontario. The par of the stock is $50, and the sale realized an average of 190¾ for the entire lot. The most positive evidence as to its value was afforded in the action of the Directors and long time shareholders, who took between them at least 75 per cent. of the total. In the list was the name of the Company's veteran and well-loved Manager, Mr. William H. Pearson, to whose sagacity in every sense is due, far more than to that of any other 10 men ever in the Company's lengthy list of wise and active counsellors, its almost marvellous success. The Toronto *World*, of the 7th inst., in editoral comment on the sale, had this to say:

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SMITHSONIAN DEPOSIT.

"Although the purchase price of the new issue of Consumers Gas Company's stock shows an average reduction of about 10 per cent. from that reached at the immediately preceding sale, and so far showed the altered financial situation, the wonder is not that a decline occurred, but that it did not reach greater proportions. Indeed, it can scarcely be said that the commonly reported tightness of money had any direct effect at all, the significant point being that with the high interest rate now current in call loans, mortgages and other classes of investment, plenty of buyers were found for gas stock at a return of little over 5 per cent. This is a striking commentary on Mr. Byron E. Walker's somewhat rash statement that money could not be found to take up the public utility securities of municipalities. Undoubtedly the prevailing sentiment among local financial experts, influenced perhaps by the opinion of Mr. Walker, and by the abnormal stringency of the general market, was that the gas stock would have to be disposed of at a sacrifice price. The result entirely upset the calculations of the talent, and clearly indicated the public preference for investments in propositions where they know their interests are safeguarded. The Gas Company is a quasi-municipal enterprise, and is under sufficiently strict control to insure freedom from stock manipulation. It seems plain enough that the conditions under which the Company operates have produced a strong feeling of confidence in the minds of the shrewdest investors. If it exists under partial municipal control, the fair inference is that this measure of confidence would be still more increased by full public operation. The object lesson of the sale is that private funds are readily available for really substantial securities, but not for such as are under suspicion of having been watered for the benefit of promoters."

CURRENT COMMENT.—

THE Shamokin (Pa.) and Coal Township Light, Heat and Power Company has been organized to operate under consolidation all the Companies organized for the purpose of supplying light, heat and power from central stations in the districts named. The Shamokin Gas Light Company is a member of the merger.

MR. MARTIN E. JENSEN has been appointed a member of the Norwich (Conn.) Board of Gas and Electric Commissioners, vice Judge John M. Thayer.

THE Gas Bench Construction Company, of St. Louis, Mo., evidently is getting its share of trade, as the following orders recently placed on its books go to show: Butte (Mont.) Light and Fuel Company; Wausau (Wis.) Gas Light and Coke Company; Oberlin (O.) Gas and Electric Company; Fort Worth (Tex.) Light, Heat and Power Company; Lockport (N. Y.) Gas and Electric Company. Just a glance over the list also shows that limits are not for its trading. For instance: Lockport, N. Y., and Butte, Mont.; to say nothing about Lockport and Fort Worth, Tex.

MR. FREDERICK A. BARTON has resigned the post of Manager to the Stoughton (Mass.) Gas and Electric Company.

THE REV. ALBERT EATON FITCH, of Los Angeles, Cal., is President of the Automatic Billing Company, which concern was incorporated in Los Angeles, with a capital of $1,000,000, for the purpose of (as a contemporary says) "putting on the market an invention which promises to work a revolution in the gas business." It is further said "That this invention is a little machine which is attached to the gas meter for automatically reading it and automatically making and delivering a complete and absolutely correct bill without the intervention of bookkeeping work."

MR. J. P. BROWN has resigned the place of Superintendent to the Fremont (Neb.) Gas and Electric Light Company.

MR. ROBERT SEITZ has been reappointed Superintendent of Manufacture and Distribution to the Hillsdale (Mich.) Gas Company.

THE consolidation of the properties of the Michigan City (Ind.) Light and Power Company and the Michigan City and Northern Indiana Gas Company has been perfected. The title of the merged interests is that of the Michigan City Gas and Electric Company, and the capitalization is: Bonds, 5's, $750,000; stock, $800,000.

PRESIDENT KENAN, of the Union Gas and Electric Company, was to have made a trial trip in his huge balloon yesterday, the ascension to take place from Oakley Park, Cincinnati. The bag, which is said to be the largest one ever constructed, is rated to carry 85,000 cubic feet of gas, and the car will comfortably carry 7 persons.

THE women of Winnetka, Ills., seem to have carried the day in respect of their purpose to have the local authorities construct a gas works, for early in the month they petitioned on such account to Mr. Robert H. Wallace. A week ago that gentleman reported that plans for such a plant were in course of preparation, so gas works' builders might find it advantageous to take a trip to Winnetka, when "the weather gets settled."

[Continued from Page 886.]

SIXTH ANNUAL MEETING, WISCONSIN GAS ASSOCIATION.

HELD AT HOTEL PFISTER, MILWAUKEE, WIS., MAY 15-16, 1907.

FIRST DAY—MORNING SESSION.

Discussing the Paper by Mr. Henry I. Lea.[1]

The President—Gentlemen, the paper by Mr. Lea is now open for discussion. Has any member any remarks to make or questions to ask?

Mr. R. B. Brown—I would like to second Mr. Lea's suggestion that the question of heating values is a very important one for us to consider at this time. Restriction by legislation has become a matter of such importance to companies manufacturing coal gas that I think the knowledge of the relation between characteristics of the coal and possible heating value of the coal gas will have to be studied in a scientific way. We have been following this question of heat value in Milwaukee for a number of years—a majority of the companies have not been doing so—and in saying that a majority of the companies have not been, that does not only apply to the smaller companies, but equally to the larger ones of the country. If we are to have legislative restrictions and requirements as to the heating value of gas, and I think we will without question, the point becomes one of immense importance, and our experience here in Milwaukee is such that, while we have not learned anything in an exact or scientific way on the subject, we do know there is a very direct relation between the possible quality of the gas and the characteristics of the coal as to heating value and as to the relation between fixed carbon and hydrogen content, and that certain changes in the coal invariably cause corresponding changes in the quality and grade of the gas. Further, that these changes cannot be eliminated by changes in the method of treating the coal, in the character of the apparatus, or in the method of handling the gas after it is carbonized, or even in the temperature or the rate of carbonization. So we are satisfied it goes back to the question of the character of the coal. From certain coal we can make a certain quality of gas, while from others that quality of gas cannot be made. The suggestion to me personally made by Mr. Lea seems along lines that should be followed up, and I think it would be a very desirable thing for the Wisconsin Association to keep the lead on this thing in making to the American Gas Institute the suggestion that it is the sense of our convention that this subject is an important one and one upon which we would like to have as much light as we can possibly get in the near future, and that we suggest it as one of the important subjects for their research—this question of classification, the relation of coals as to their value for gas making purposes, not alone along the lines of the yield of coke and tar and ammonia, but of the *qualities* of the tar and coke and of the *gas*.

The President—Any further discussion?

Mr. Brown—I make that as a motion, Mr. Chairman.

The President—The Chair thinks it would be well to put the motion of Mr. Brown in the form of a resolution. If he will do that and pass it to the Secretary I have no doubt the convention is ready to vote on the subject matter of the resolution as stated by him at this time, and believing that to be the sense of the convention, I will put the question as to the adoption of the suggestion in the form of a resolution, as stated by Mr. Brown. Those of you who are in favor of the adoption of such a resolution, suggesting to the American Gas Institute the adoption of measures for the testing of coal, will say "Aye;" those opposed, "No." [Carried.] It is the custom of the Association to extend thanks to the authors of papers that are presented before the Ascociation, and I will extend the thanks of the Association to Mr. Lea for the very able and instructive paper that he has presented.

An adjournment was ordered to 2 o'clock, P.M.

FIRST DAY—AFTERNOON SESSION.

The President called the convention to order and read this

TELEGRAM:

In behalf of the American Gas Institute, best wishes for a profitable meeting.—(Signed), WALTON CLARK, President.

The Secretary was appointed a committee of one to reply.

At the suggestion of the President, the Secretary read the

ROLL CALL.

Active.

Asendorf, C.	Brown, R. B.	Buck, H. M.

1. "A Prepared Classification of Gas Coals," by Mr. Henry I. Lea; see JOURNAL, May 27, p. 886.

Cornish, R. C.	Haase, E.	Linstedt, J.
Corscot, J.	Harmon, H.	Luebkemann, C.
Crawford, H. T.	Hazeltine, W. E.	McAdam, B.
Cutcheon, M. H.	Humphreys, H. M.	Mason, J. T.
Douglas, D.	Hyde, H. H.	Richards, F. M.
Draper, N. C.	Johnson, W. B.	Rutledge, F. J.
Eastman, J. P.	Kelsey, F. P.	Schaper, H. C.
Gelatt, P. M.	Kraft, R. P.	Unger, J. S.
Glass, S. J.	Luenberger, W. A.	Viles, B. D.
Gregg, G. F.		

Associate.

Bredel, F.	Rieha, E. L.	Stratton, S. E.
Lea, H. I.	Schall, H. D.	Whitney, H. M.
Martin, E. B.	Shirra, J. C.	Wickham, L.
Parker, John F.		

COMMITTEE ON PLACE OF MEETING.

The President—At this time I will appoint as a committee to designate our next place of meeting Messrs. M. T. Walker, P. Young and B. D. Viles. I will also state that some other applications for membership will be included with the names of other members presented during the forenoon session in the report of the Executive Committee when that report is made.

CHANGING THE DATE OF MEETING TIME.

The Secretary suggests that, inasmuch as we have a fairly large attendance this afternoon, the fixing of time for meeting, which was postponed this morning, might be definitely determined at this time. It was suggested that, instead of the time being in February as heretofore, it should be the corresponding days in May. The Chair is ready to hear any motion or any discussion of the matter. Mr. Glass, I think, had some idea on the subject this morning.

Mr. Glass—It seems to me that it would better to have the meeting in March instead of May, as suggested in the report of the Executive Committee. May is a pretty busy month for all of us, while March, as a general thing, is not so busy. I think, as far as the Milwaukee contingent is concerned, we would prefer March to May, but would like to hear from some of the others.

The President—Mr. Wortendyke, have you any ideas on the subject?

Mr. Wortendyke—Personally, May would suit me much better than March. It seems to me that as in May we all have our work pretty generally outlined, most of us can get away for a couple of days. The weather, too, is pleasanter, to my mind. I prefer May.

Mr. Hyde—We should bear in mind to select a time which would be most convenient to the majority, so we can get as many as possible of our members present. That is what the object is in supporting a change—to make it most convenient in getting out the largest number of men. If the street and other work begins about the 1st of April, and there are a great many interested in street work that would like to come to the meeting and could not otherwise, then let us change the meeting to some time before the street work is begun. With us it does not make any particular difference. Construction work of all kinds does not begin generally until spring.

Mr. Glass—If the meetings are to be held in Milwaukee, it makes very little difference to the representatives of the Milwaukee Company what time they are held. It is a question to be considered from the standpoint of the outside companies rather than from the Milwaukee Company.

The President—Mr. Gelatt, have you any preference?

Mr. Gelatt—I can't say that I have any particular preference one way or the other. One month suits us about as well as the other. The weather seems a little pleasanter in May than March for the trip. That is the only consideration I have in mind.

Mr. Wortendyke—I suggest we take a ballot, and let the voters say which month they prefer—March, April or May. The suggestion was acquiesced in, a ballot was taken, and the month of May was agreed upon.

The President—Unless there is some other business, we will now listen to the paper by Mr. F. M. Richards, of Madison, Wis., on

BENCH FUEL ECONOMIES.

[For the text of the paper, see JOURNAL, May 27, p. 886.]

Discussion.

The President—The paper is before you for consideration and discussion.

Mr. J. P. Eastman—Does Mr. Richards have as much trouble with the economizer by reason of carbon forming in the retorts as he did otherwise.

Mr. Richards—I cannot see any difference.

The President—I will call upon Mr. Lea.

Mr. Lea—I haven't had any experience at all with the economizer. All I have to say is that they are apparently doing excellent work, and we ought to know more about them. At any rate, we should certainly give a fair hearing to all claims made. They are evidently a step in the right direction.

Mr. Bredel—This thing should be called by its right name. The Siemen's invention was used in Europe in the later '70's and abandoned on account of cost and maintenance. Any retort bench of a good recuperative style will give the same economy as when carbonic acid is forced under the grate; but if a gas bench is neglected and no attention paid to it you can't expect good results. If you introduce steam or water and the air doesn't mix entirely with the water vapor, the result is that the air will make a passage for itself, and so will the water vapor; but if the water vapor is thoroughly mixed with the air and introduced under the grate you will get equal, if not better, efficiency than you ever can expect by introducing carbonic acid. This whole thing was experimented with by Siemens and abandoned everywhere as bad policy.

Mr. Unger—The paper notes something about the loss due to the making of steam. I suppose there are very few gas benches supplied by steam generated in the boiler. It should be made by waste heat, because there is more than sufficient heat in the waste gases to heat the air for combustion. I do not see that there could be any gain in using carbonic acid, because we have the steam for nothing anyway. Of course, we know there is generally a surplus of steam going through the generator. But if steam is admitted in proper quantities there would be very little loss on account of steam getting through. I would like to note that the gentleman does not say anything about the cost of steam for running the blower. I suppose a blower is run in connection with the bench, or a steam injector or air compressor.

Mr. Richards—That has not been introduced on account of the fact that we used steam under the benches previous to the use of the economizer, and we noticed no change in the boiler fuel, the cost being about the same as before—in fact, I think it requires less steam to run the small engine, because the blower only generates 23 ounces pressure, and I am quite certain it requires less steam to operate that than it did to operate the other benches. Regarding Mr. Bredel's statement, he does not seem to take into account that all of this vapor passes through the fuel bed and absorbs heat which is carried off in the stack. A certain amount of heat is required to bring that up to the 212°, and then he has his latent heat of vaporization. I would like to know how he figures out that we get that difficulty with the CO_2.

Mr. Lea—Mr. Bredel takes a wrong view of one thing in particular there. Siemens did partly understand this thing about 50 or 60 years ago, but he discredited some other things in connection with CO_2 which now we know are right. Siemens built a gas producer and used what he was pleased to call "Heat column." At any rate, he had his gas producer outlet run up a long incline and his gas came down the far side of that incline, creating thereby an unbalanced column. Thus he got the draft through the producer. It was a very good producer in its day, but better producers are made now. I do not think it is fair to say that the CO_2 schemes have been condemned. There are possibilities in the CO_2 above water vapor. It is possible to get a higher thermal efficiency using CO_2 than there is by putting steam through the fuel bed. It can be shown by calculation, if you wish to go into it.

Mr. Bredel—I beg to differ with my friend. He didn't seem to understand exactly what I was driving at. In introducing CO_2 you introduce steam, just as much steam as is necessary to keep your clinkers soft. CO_2 itself will never keep clinkers soft.

Mr. Lea—The CO_2 has no connection. The formation of the clinker is absolutely a function of temperature, and as long as you keep that temperature below a certain point it does not matter whether you have steam or CO_2 as far as clinker is concerned. As long as you stay below the fusing point of silicates you are all right.

Mr. Bredel—I beg to differ with you. It is simply a question of forming an oxide or hydrate. The hydrate is soft while the oxide is hard and fuses. The hydrate will not fuse.

Mr. Lea—Did Mr. Bredel ever encounter a clinker in any kind of fuel bed without fusing the silicates?

Mr. Bredel—It is not a question of the silicate as much as it is a question of iron.

Mr. Lea—Did you ever form a clinker without first fusing the silicates?

Mr. Bredel—Without fusing the silicates—why must silicates be present?

Mr. Lea—Why must iron pyrites be present in some coal? We know it is there.

Mr. Bredel—Yes; but iron forms the clinker and not the silicate.

Mr. Lea—Iron is one of the things in clinker.

Mr. Bredel—It is the iron only.

Mr. Lea—Will you undertake to show a clinker without any silicate?

Mr. Bredel—Certainly, if the coal doesn't contain it?

Mr. Lea—Will you undertake to find a clinker that has no silicate?

Mr. Bredel—No; but it is the hard pyrites fusing and not the silicates.

Mr. Lea—The point of the whole thing is that it is the temperature and not the presence of CO_2 or steam.

Mr. Bredel—It is a question of forming an oxide or hydrate. The hydrate is soft; the oxide is hard every time. You could'nt make an incandescent light if you formed it into a hydrate. You have to reduce it into oxide.

Mr. Lea—Will you say, then, Mr. Bredel, if it is possible to operate without the formation of clinkers?

Mr. Bredel—Yes.

Mr. Lea—How will you do it?

Mr. Bredel—With steam vapor.

Mr. Lea—What is the action of the water vapor on the fuel?

Mr. Bredel—Hydrating.

Mr. Lea—What does it do with the temperature?

Mr. Bredel—What has that to do with it?

Mr. Lea—That is the whole thing.

Mr. Bredel—The results are the same.

Mr. Lea—If you will undertake to run a fuel bed at a temperature that I will specify, I will let you put any quantity of steam in that you can pump through, and yet show you clinkers forming.

Mr. Bredel—I don't know what you are going to do. You want to get in cold air and steam. Anybody who does that naturally is beyond redemption.

Mr. Richards—Mr. Bredel, where does the steam come from with CO_2? He claims we get as much steam as if we didn't use CO_2. We use an air injector to draw in this CO_2. I don't see where we get any steam. We don't have any water in the ashpans and none gets near the bench.

Mr. Bredel—I understood the injector was run by steam. If the injector is run by compressed air, then the cost of compressed air will more than counterbalance the saving of fuel.

Mr. Lea—Has Mr. Bredel any figures on that point?

Mr. Bredel—I made these figures about 3 years ago, and gave them to Mr. Baehr in St. Louis. I could give them to the convention if the paper had been submitted to me before it convened, but I am not at this moment on a snap-up judgment ready to give you all these figures. Of course, the only figures I can give you are on steel and glass furnaces and the comparative cost per ton.

Mr. Lea—I have Mr. Baehr's own statement that a very important saving was actually being made through the introduction of CO_2 instead of steam.

Mr. Bredel—It is not Mr. Baehr's statement. It is a statement I gave to Mr. Baehr.

Mr. Lea—It is a statement made by Mr. Baehr after operating the benches with CO_2. Before you pass that subject, I would like to ask Mr. Richards how often he finds it necessary to clinker his benches of 6's, operating this fuel economizer?

Mr. Richards—As I understand the query, Mr. Lea wants to know how often we remove clinkers from the bench. We don't remove any clinkers. We haven't any clinker formation at all. Just shake the bars and run the ashes down through.

The President—I believe Mr. Young might discuss this paper somewhat.

Mr. Young—I never had any experience with the economizer, and I don't know anything about it. The results are certainly very remarkable, and I would like to ask Mr. Richards—he says he has had some labor troubles—if these were brought about by the extra work put on the men? [Laughter.]

Mr. Richards—It had no connection at all with labor trouble. In fact the work is much less with the economizer than before. The firing is practically the same as it was before as far as putting the fuel in is concerned. Of course, where the work is lessened is in taking care of the fire below—practically no hard work down there. Just a matter of shaking the bars, letting the fire down a little and removing the ashes.

Mr. Bredel—Mr. Chairman, the results obtained are nothing so very remarkable. Our friend Mr. Brown, who is unhappily not here, will bear out my statement, that in Newark, N. J., 16 per cent. of coke was used, which amounts to from 10 to 10½ pounds of fuel per 100 pounds of coal. This was the fuel consumed. If the consumption as stated in the paper is close on to 10 pounds, besides that should be added the fuel consumed under the boiler, the cost of the power plant and the royalty. I think that in a bench of 6's the ordinary way of firing is better.

Mr. Mason—There are two items in Mr. Richards' paper on which I would like to get a comparison. He does not mention his heating value nor candle power for the years 1905 and 1906.

Mr. Richards—There were practically no changes as far as this paper is concerned. It does not make any difference.

Mr. Mason—You must have results between your candle power and heating power, do you not?

Mr. Richards—That has no bearing on the paper.

Mr. Mason—You have nitrogen, etc., which of course makes a difference.

Mr. Bredel—One-half inch more on the exhauster makes a lot of difference in the fuel.

Mr. Richards—We run ours by atmospheric pressure.

Mr. Cutcheon—I would like to ask you how this carbonic acid is introduced?

Mr. Richards—By means of an air inductor. The air is compressed. About 23 ounces is what we use. There are passages leading from the top of the recuperator underneath the retorts to the throat of the injector, and through the throat and into the front beneath the grate bars where we get a slight pressure there.

Mr. Cutcheon—How do you gauge your mixture of air and carbonic acid?

Mr. Richards—We take tests.

Mr. Cutcheon—How often?

Mr. Richards—We don't make a practice of doing that; only just bringing up a new bench. The men can tell by the color of the fires. It is very easy to regulate it.

Mr. Cutcheon—What proportion of the fuel in 1905 was coke and what was that proportion in 1906?

Mr. Richards—I haven't those figures here. I think nearly all of the bench fuel in 1905 was coke. Very little coal was used and only for a short time. During 1906 the entire fuel was Youghiogheny lump coal.

Mr. Cutcheon—Mr. Richards, don't you think that some of your good results are due to using coal as bench fuel?

Mr. Eastman—At the last meeting I took quite a little notice of this economizer and thought very well of it, but have been thinking it over a great deal since that time. As near as I can figure out from running the ordinary benches we get in our ashes about 5 per cent. of fuel unconsumed which the economizer will consume, and I think if we could consume that extra 5 per cent. that we lose in the ashes that the economizer would not be of much benefit.

Mr. Richards—I would like to say that it depends a good deal on what you do with that heat. If it goes to the retorts you will save the 5 per cent. If it is dissipated in your water vapor and goes out of the stack you don't save it.

Mr. Lea—Has anybody a record of tests made which show that the carbon content taken from the ash runs 5 per cent. or less.

Mr. Eastman—Of the screenings? I have never been able to consume it all.

Mr. Lea—I understand you to say the ashes only had 5 per cent. and that the economizer must make its only saving from this consumed.

Mr. Eastman—That is about as near as I can figure out the unconsumed carbon content in the ashes.

Mr. Lea—Mr. Bredel, what would you say?

Mr. Bredel—I don't think I can answer Mr. Lea's question because I don't think it is fair to him. It would depend entirely on the coal. We made a continuous run test that showed, with ½ domestic coal and ½ English coal 7½ per cent. I remember that, the other I don't remember.

Mr. Russell—Mr. Richards, what is the temperature of the flues below? I mean the waste gas flues immediately under the retort, as I understand it. I may be wrong, but as I understand it they draw the CO_2 from the flue under the retort after the retorts have received, of course, the full benefit—passed through and around them. Now it would seem to me that, in drawing away the CO_2 at that point, the heat continuing to pass down through the recuperators must be very much reduced, consequently the secondary air passing up through the air flues must be very much less than in the ordinary method of operating a recuperator bench; and, therefore, I should think that you would lose considerable economy ordinarily secured by the high temperature at which the secondary air usually enters the bench from the furnace arch. I don't know whether I am correct in my supposition or not. Another question I would like to ask is how this bench fuel coal is introduced into the bench—what method they have of firing that coal?

In other words, how often they fire, how much they fire at a time, if they fire to the rear, to the center or to the front of the furnace.

Mr. Richards—I have no records as to the exact temperature of the flues underneath where the products are taken off and put under the grate, but as far as the appearance goes, the color of the bench, etc., we have operated the old-style bench and the benches equipped with economizer side-by-side, and as far as observation goes I cannot say that there is any difference. The amount drawn off and put under the grate in volume is only a small percentage of the total product, in the first place. It would not make very much difference. I think the temperatures of the stack gases are about the same in either case, and I don't see why there should be any difference because these products are not taken off and discharged from the bench at any other point. They are merely a carbon-carrying medium, so-to-speak. The CO_2 comes up through the fuel bed and is broken up, and probably most of it passes into the combustion chamber as CO, where it is again burned as CO_2, and in that way goes on around again. I don't think there is any loss, and I think you will find about the same quantities of products are passing off at the stack as in the other form of bench. Regarding the firing of the fuel, the furnace is kept well filled with a deep fuel bed, which we could not do so far as we have experimented without the economizer. We had to carry a much lower fuel bed. Considerable difference exists in the matter of the firing door with which the bench is equipped. We have some of the old Laclede settings, the doors of which are designed for firing hot coke from the retorts, and it is very difficult to place the coal with a shovel. It has to be thrown in in a heap and pushed back with a bar, and in these benches we use that method of leveling the fire. In the latest bench we put in (it is designed by the Improved Equipment Company) the slant is such that the stoker can place the fuel at any point he desires when throwing it in. In that bench no bar is required. I don't know that we have any regular time for firing. One bench might take fuel oftener than another, but I don't think there is much difference. The men use their own judgment. We have a good lot of men who keep the fuel well up, never letting it get down at all. Not much fuel is put in at one time, because no great amount of ash is removed at any one time. Where there is a large amount of clinker formed in the old type of bench the fuel bed is lowered sometimes as much as 2 feet by clinkering and requires a large quantity of fuel put in to replenish it, whereas we have only a small drop in the fuel bed when the ashes are shaken down. When the fuel is put in—I could not say just how many shovels of coal are put in at a time.

Mr. Bredel—Our friend says only a small amount of carbonic acid is introduced. A mixture of 4 per cent. CO_2 and 16 per cent. oxygen amounts to 20 per cent. of the old waste gases. By introducing the other one, 10 per cent. oxygen and 10 per cent. CO_2 mean at least 50 per cent. I would like to know where the small amount comes in?

Mr. Richards—I don't see that it makes any difference if you circulate a volume twice the amount of your stack gases, as the amounts of products of combustion resulting from the introduction of the primary and secondary air will pass off at the stack regardless of the volume of CO_2 gases that may be allowed to circulate through the fuel bed. I don't see it has any bearing on the matter at all. It looks to me as though it is merely circulating.

Mr. Bredel—It certainly makes a difference, for it certainly has not the ability to heat your secondary air up to the desired temperature. I read papers, once in Detroit, and once I believe Janesville, in which I tried to show that it is not a question of the amount of heat developed in the combustion chamber, but rather of quality. Anything that develops less than 2,000° F. is absolutely of no use for heating a retort, so if you can bring up your flame temperature say to 3,000° you have an efficiency of only 1,000°, but we have to figure on a higher specific heat of the gases, so you really got—by a difference of 1,000°—about 66 per cent. efficiency instead of 50. As I stated before the whole question resolves itself on the flame temperature in the combustion chamber. If you could raise the flame temperature to say 10,000°, which is naturally impossible on account of disassociation, that would be the most efficient bench. If hydrogen is present, it simply means that the combustion chamber has to be larger. Now, for instance. In a bench of 9's, where there is a lot of water evaporated, you might run very economically when you want to make about 9,500 cubic feet to the standard sized retort, but if you want to make 11,000 cubic feet, you had better have your water vapor down to 30 per cent.; that is to say, 30 pounds of water per 100 pounds of fuel consumed is about the standard for Youghiogheny coal. Some coals require more, others less.

Mr. Unger—I would like to say that if the waste heat from the bench is utilized to generate the steam for preventing clinkering—for instance, by letting the products of combustion pass under the ash pan—there would be the same economy as by this CO_2 process.

Mr. Richards—It is not the evaporation of the H_2O where the big loss comes in, the way I figure it. It is the loss of heat which takes place where the vapor in passing up through the fire is broken up. It first takes on the latent heat of vaporization, then is broken up into its elements, the heat absorbed in doing this passing beyond the retorts. That is where the great loss takes place.

Mr. Unger—Yes; but is it not a fact that in carbonic acid pressure you get more carbonic acid in products of combustion than you would have with the steam process? And you will get the same amount of heat carried away practically in the products of combustion.

Mr. Richards—The carbonic acid going up through the fuel bed is broken up and goes back to CO and is again burned to CO_2 in the combustion chamber.

Mr. Unger—Yes; the CO_2 has the same specific heat as steam at high temperature, so I would say that the amount of heat carried away in the products of combustion would be the same whether you used steam or CO_2 for cooling off the furnace.

Mr. Richards—The CO_2 does not pass off through the stack as your steam does. The steam takes on this heat and carries it out in the stack and you lose it, whereas the CO_2 is broken up, forming CO, which burns to CO_2 in the combustion chamber, giving up heat to the retorts.

Mr. Unger—Yes; but my point was if you can utilize your waste heat for making steam you would not gain anything by using this process, by reason of the additional trouble; you must have machinery in order to introduce the CO_2.

The President—Mr. Court, what have you to say on this subject?

Mr. Court—I know absolutely nothing about the fuel economizer except that we occasionally run across it in our travels and find that some people think it a very good thing, while others have thrown it out. It is really the policy of the supply men not to attack any other make of bench, and, just as I say, I don't know anything about the economizer. We have never used it, never had anything to do with it.

Mr. Russell—This matter of bench economy in fuel, whether it be a fuel economizer or any other proposition which tends to reduce the fuel required to heat benches properly, of course is of great interest, not only to the gas men but to the men who are constructing benches; and it would be senseless for a bench constructor to decry anything that was good, just as it would be for the gas man to put out something that was really of no value, because the glimmer was pretty bright. Now, as I said before, it would seem to me that, in drawing away a certain proportion of this CO_2, whether it be 20 or 50 per cent., or whatever figure, would necessarily reduce the amount of heat in the flue below, tend to reduce the temperature of the secondary air where it entered the combustion chamber. I can't exactly understand the idea of circulating. It would seem to me, if that is the case and you do recover it all, and the heat does go out at high temperature to the waste gas flues, that Mr. Doherty has not only invented an economizer, but has invented perpetual motion.

Mr. Glass—Mr. Brown has had quite a little experience with benches and so on, and I hoped he would be here to take part in this discussion. He left the office to come here, I have been expecting every moment he would come in, and if the discussion is going to be dropped, I think it would be worth the time of the Association to take it up again when he comes in.

The President—Possibly he followed the band off to the theater.

Mr. Glass—Perhaps, he may have.

Mr. Cornish—I would like to hear Mr. Bredel's figures. Perhaps we could put this over until to-morrow morning.

Mr. Bredel—I am perfectly willing to do it, providing you have it in German. Of course it shall be in German, or if you prefer, in French or Italian.

The President—You have no American data?

Mr. Bredel—No, sir; connot do it, but I am perfectly willing to bring the books down here. I think it would be a great deal easier, considering the amount of references we have on this subject, that this meeting move up to my office where the records are.

Mr. Cornish—I meant more particularly the figures given to Mr. Baehr. You probably have that in a letter?

Mr. Bredel—I gave Mr. Baehr about 15 statements, and told him afterwards that life was too short to look up any more records.

The President—Mr. Carter, have you anything to offer on this subject?

Mr. Carter—At the end of the paper the figures 182 are given for the bench fuel per ton of coal carbonized from July 1, 1906, to January 1,

1907. I would like to know if any better results were obtained anywhere that one can be given in this connection.

Mr. Bredel—The figures are incorrect, in that they only give the fuel consumed under the bench, and do not give the fuel consumed under boilers. I wish he would give a complete statement of the entire fuel consumed, for what is the sense of giving the fuel under the bench. You might as well heat the retorts by a hot blast stove and say you do not use anything under the bench. Give the entire statement, not a half-way one.

Mr. Richards—Regarding the steam consumption of the boiler as it might affect these figures. Where water alone was used under the grates that might make some difference, but at Madison we use steam under the grates, and our records show the amount of boiler fuel per 1,000 feet, or per ton of coal, or any other way you want to get at it. We find we got a lower boiler fuel consumption per unit of gas made than we had previous to the installation. I have those figures up at Madison and am sorry I did not bring them along.

Mr. Bredel—If Madison formerly used live steam under the grate, Madison didn't run right. I put a bench in Madison years ago, when Mr. Corscot was there, and they never used a pound of steam from the boiler. If they put in benches afterwards that required live steam under the grate it showed very poor judgment.

The President—Has any other gentleman anything to offer in connection with this paper? Anybody any figures which they have left at home, that they want to present? [Laughter.]

Mr. Russell—I would like to ask if the blower at Madison is operated by steam directly, or by electric motor force?

Mr. Richards—It is operated by a small steam engine which takes the steam from the gas works' boiler.

Mr. Cornish—How many horse power of steam per bench are you using?

Mr. Richards—I couldn't give those figures to you.

Mr. Bredel—Given the steam pressure, we can figure it out pretty quick. How much fuel is consumed?

Mr. Richards—I can't give you the figures.

Mr. Bredel—Do you know about whether it is 5 or 4-inch?

Mr. Richards—I think it is about 5 by 7.

Mr. Bredel—Run under its full power, probably about 8 or 9-horse, and with their steam plant that means 10 pounds per horse power per hour; 24 by 9—figure it out yourself.

The President—I would suggest that Mr. Richards might figure it out in French, German and Italian.

Mr. Bredel—Give me the revolution and I will figure it out for you.

The President—On the suggestion of Mr. Glass, I think we had better lay this question over until Mr. Brown comes in. Perhaps then we will get up another interesting discussion on the subject. On behalf of the Association I tender to Mr. Richards its thanks for the paper which he presented, and which has provided such an interesting discussion. [Mr. Richards was presented with a carnation.] I am in doubt as to whether we should also tender the thanks of the Association to the gentlemen who presented the bouquet.

A Try at the Question Box.

The President—The Secretary suggests that we proceed with the discussion of questions submitted for consideration in the Question Box. The first one is:

> "Can anyone give a curve showing the heating power of coal gas at the various candle powers within the possible working limits of candle power of coal gas? Also the same for water gas, up to, say, 30 candles?"

Mr. Walker—I believe those figures are given in a book sent out by the American Institute. I am not positive as to that.

Mr. Bredel—I think the figures were given in the *Journal of Gas Lighting*, I read some there, and some in the German *Journals*.

The President—Any further discussion? The Secretary suggests that this question might be taken under consideration by the members during the year, and hold it over for discussion again at our next meeting. I think this suggestion is a good one. Question No. 2 is:

> "In making water gas, which is the more economical, hard coal or gas house coke, with a difference of 25 cents per ton in favor of coke; also, does the size of machine make a difference as between coal and coke?"

Has anybody any information to give the Association on this subject? Mr. Wortendyke.

Mr. Wortendyke—I have no figures that would be of value on that subject. I should think, however, that coal, at a difference of 25 per cent. and proper conditions to handle it, would be more economical than coke.

The President—The question says 25 cents per ton.

Mr. Wortendyke—I meant cents. Twenty-five per cent. would not be right, but 25 cents per ton difference, and proper methods to handle the coal, would cause coal to be the most economical fuel

Mr. Mason—I do not think there is any question about that, unless on account of the facilities for getting the fuel to the plant. It would depend a good deal on the cost of getting the coal and coke there. If you have the coke, but have to haul the coal, the cost may be twice as much as the coke is worth, wherefore it is more economical to use good coke. But if you have got the coal handy, with cheap handling facilities, coal is cheapest by all means, not only in cost, but everything else considered—the make, candle power and heating power, etc. But if the coke is close at hand, while you have to haul the coal and pay freight, it may probably send the cost of coal way beyond what the coke would be. If that is the case use your coke.

Mr. Hyde—I assume, Mr. Mason, that that question meant at one particular place; say, a difference of 25 cents per ton on the floor.

Mr. Mason—Then use coal by all means. If you put the two on the same level, or on the floor, use the coal.

The President—Has anybody else knowledge on the subject?

Mr. Walker—I would like to say, in operating a water gas plant at one point where we use hard coal, and had only one machine of the Lowe type—the carburetter was separate from the generator, and that machine was lined with a course of brick and with blocking back of it, bringing the interior of the generator about 30 to 36 inches—and afterwards operating another machine of the same size, but of little different construction, into which we injected the oil into the generator, and that machine was lined the same as the Lowe machine, we couldn't retain the heat in the coke in the machine, so we took out the rear blocks and made the generator about 8 inches larger. Using gas house coke we were able to retain the heat, and didn't get any better results on the coke question. Our coke consumption amounted to about the same that it did before we changed the diameter of the generator. We did get a better yield per gallon of oil, and could vaporize it better. The coke seemed to retain the heat, wouldn't get cold in the bottom, wouldn't come up. I don't know that I could explain the theory at all, but I do know that to be the case in our experience.

The President—We will pass to the third question, which is:

> "Can more water gas be made while heat is moderate than when very hot; also, will not the condensation be greater with a moderate heat than with a hot one?"

Can Mr. Wortendyke give us an answer to that?

Mr. Wortendyke—For myself I prefer a high heat in a fire bed rather than a low heat, letting steam go through as steam vapor.

Mr Mason—I do not think there is any question about which is the better to give the highest results. High heat is what you want in general. Your heat must be high enough to dissociate your steam and vapors or the steam is going through the condensers and back into water again. I operate my generator at as high a heat as I can get it.

Mr. Wortendyke—That question then is one of economy of operation. Isn't that the way he puts that question?

The President—Can more water gas be made while the heat is moderate than when it is very high; also, will not the condensation be greater with moderate heat than a hot one?

Mr. Wortendyke—No question about that.

The President—The fourth question is:

> "How many heat units are required theoretically to carbonize a ton of coal?"

It is not said whether it is gross or net. [Laughter.] Can anyone answer the question?

Mr. Unger—Referring to the paper read at the Paris Convention, in 1900, by Euchene, it would seem that the heat formed by some of the volatile products in their combination is sufficient to decompose other parts of the products, so that if all the heat taken away by the gases going into the chimney, the radiation, the sensible heat of the illuminating gas, the heat in the red hot coke could be returned again in some way, no outside source of heat would be needed to carbonize the coal.

The President—Anyone else any information on the subject? The next query is:

> "How many heat units are used in actual practice; or how near are we to theoretical efficiency?"

There is no necessity for anyone taking a back seat here. Come right forward.

Mr. Harmon—I would say from the statement that Mr. Unger just made, and judging from the coal bills of the gas company, that we are pretty far away from theoretical perfection.

The President—Has anyone else an opinion on that subject, Mr. Unger, can you give any?

Mr. Unger—I am afraid that, as my last remarks were received with some hilarity, it would not be wise to talk again. I will say that in a coal pile no outside oxygen gets in. There doesn't have to be anything in the coal in order to fire it, and the fact that the coal can fire itself when there is no means of getting into it shows there is this energy in the coal which can decompose it—can carbonize it.

The President—Question No. 6 is:

> "What is a good method of recording the pumping of drips, with a view to avoiding unnecessary visits to them, and at the same time insuring an uninterrupted supply of gas to all consumers?"

I will call on Mr. McAdam.

Mr. McAdam—As there may be several good methods, it is all a matter of opinion. I think it is a mistake for one to think of passing up any drips, no matter how often they may be found dry. In Milwaukee we have a list of our drips in book form, which list is given to the drip pumper, and any drip that we want pumped every day has the figure 1 before it; every 2 days the figure 2; every 3 days the figure 3—we don't go beyond the figure 3. As soon as the drip pumper has taken care of these he is supposed to take care of the others, no matter how he finds them. It is not because he may find water, but can report any other trouble. One may be broken. Some of the youngsters who may have been having a bonfire in a street that is being graded may cover up the drip, and we want to have it uncovered. We have in Milwaukee drips that probably don't give a pint of water in a year, but suddenly we are called upon to take care of one of them, because there are several people in the neighborhood out of gas. That invariably takes place in the spring. After a thaw a leak has developed, and we are not aware of the fact until the people are without gas; your pipe suddenly fills up and you want to be able to locate and take care of that drip. So it pays to have your drips examined carefully, no matter how dry, as often as possible.

The President—Any other member anything to suggest on this question as to the method of pumping drips? I notice, gentlemen, Mr. Brown just came in, and as we postponed the discussion of Mr. Richard's paper on the Doherty economizer until he should return, I will announce for his benefit that he is expected to say something on the subject to-morrow, after he has read the paper to-night and considered it.

Mr. Brown—Thanks for the respite.

The President—We will go on with the questions. The seventh question in the box is as follows:

> "Is it not necessary to have the leather of meter diaphragms cured by saturating them with diaphragm oil a longer period of time than is at present the custom? And should they not be cured to suit the different kinds of gas, such as dry gas, coke oven gas, coal gas, mixed gas, etc.?

If Mr. Walker, of the Milwaukee Company, knew anything about that we would call on him, but he doesn't have anything to do with the meter question. Mr. Walker, it is suggested that you might give some light on the subject anyway, being a man of universal knowledge.

Mr. Walker—I don't think I am competent to talk on that subject. I was looking around for a meter man to supply my place, but they have both gone. I have had nothing to do with meters for many years, and the action of the different qualities of gas on the leather I would hardly be able to state, but there would certainly be a difference. Now, in an offhand opinion I would simply judge that it would be almost impossible to treat leather for the different qualities of gas. There is a certain pliability of the leather which is necessary for the proper mechanical action of the meter no matter what gas goes through it, and the question of the different qualities of gas would only shorten or lengthen the time in which a renewal would have to be made.

Mr. Humphrey—I would like to suggest to the inquirer that he read the Proceedings of the American Gas Institute and perhaps this question will be answered. A very fine paper was given by a meter manufacturer who took up this very point, and explained how it was that in diaphragm oiling it was necessary to make allowance for the different condensates in gas.

The President—Has anyone else anything to offer? Mr. Brown.

Mr. Brown—I do not think I can answer question 7. The paper referred to was read at the Gas Institute meeting in Chicago last fall, by Mr. John M. Rusby. This question of diaphragm oils has been gone into more or less thoroughly by gas men of all descriptions, for the last 25 years, and apparently they have all been on the wrong track. They have used all sorts of special, high priced grades of oil—almond oil, and various grades of animal oils and mixtures have been used by the English gas fraternity; and every change made has been in the direction of getting something more expensive, but apparently without getting any better results. Mr. Rusby said that in his experimental work he used only cheap oils, and, as a result, found a very cheap, common grade of Pennsylvania machine oil that apparently does just as good work as anything ever used. We have several hundred meters out with this grade of oil that are doing better work than before. Another thing. One of these questions says something about oiling the meter diaphragm by capillary attraction, which probably comes from some one who read that paper, but Mr. Rusby has gone further, for he found that when the diaphragm has once been thoroughly oiled it has capillarity enough to carry up oil clear to the top when allowed to dip in oil placed in the lower part of the case. The experiments which have been performed will go to show that that oil will keep the diaphragm in perfect condition for 3 years. If this turns out as well as the first experimental work would warrant us in hoping, our diaphragm troubles are over.

Mr. Eastman—What grade does Mr. Brown use? Great Atlantic, or any other special name?

Mr. Brown—It is a light grade of Pennsylvania machine oil. I can and will get a description of it so that we may know exactly what we are using.

Mr. Eastman—Costs about 20 cents a gallon?

Mr. Brown—Twenty-two cents, I think; something like that. The Standard Oil people have given us a number of samples, and claim that they can duplicate them, and as soon as we know just what we are going to use I should be glad to give the information to anyone.

The President—Question No. 8 is:

> "What is the best method of preventing bleaching of meter diaphragms?"

As soon as we come to these meter questions the meter men all duck out. Has anybody any answer to make to question No. 8? If not, we will pass to the next questions, and if anybody thinks of an answer to No. 8 he can submit it later. Question No. 9 is:

> "What is the best method of oiling meter diaphragms that are bleached?"

And No. 10 is:

> "If meter diaphragms are oiled by capillary attraction, drawing oil up from the bottom of the casing, will it oil the diaphragm evenly and prevent bleaching?"

Mr. Brown ought to know about that.

Mr. Brown—It is an experiment that is being tried now. We don't know how long that is going to prevent bleaching; but a 5-light meter came in this morning that had passed somewhere about 65,000 feet, and so far it has prevented it. If this thing is a success it answers all those questions at once. If it is not, we will try some other method.

The President—Now we come to question No. 11:

> "What pressure is considered the best for mantle lamps, particularly gas arcs?"

It seems to me quite a number could give light on that subject. Mr. Rutledge.

Mr. Rutledge—I have no definite information to offer. However, I think there is no question whatever but that a high pressure will give better results. I should say anywhere from 30 to 40-tenths.

The President—Mr. Johnson, what is your experience? You have had some; possibly you have forgotten.

Mr. Johnson—I have not had a great deal of experience. I think, though, somewhere around 30 to 35-tenths.

Mr. Patton—I would like to have Mr. Brown and Mr. Rutledge state what pressure they carry in Milwaukee?

Mr. Brown—Our intention is to carry minimum, 25 tenths; maximum, 4 inches. We slip that a tenth or two occasionally, but not very much. I should like to see that minimum above 3 inches if I could.

The President—Anything further on the pressure considered best for mantle lamp? If not, we will proceed with question number 12:

> "What pressure is considered best for a works to carry when gas is used for all purposes; *i. e.*, stores, engines, mantle lamps, and open burners, etc.?

Mr. Brown thinks about 40-tenths maximum down to 25.

Mr. Cutcheon—I would like to ask Mr. Crawford, of Waukegan, if they got any more candles to the cubic foot of gas in street lighting than they would with low pressure. I understand they use the pressure directly on the burner.

Mr. Crawford—We find better candle power at high pressure. I do not think a street lamp or any other incandescent lamp, will do as well under 30-tenths as it will between 30-tenths and 35-tenths.

Mr. Cutcheon—I asked that question because Mr. Chipley, of Grand

Rapids, Mich., who made some experiments with 25 pounds pressure, claims to have gotten very much better results as far as candle power is concerned than he would under 30-tenths or any ordinary pressure. Perhaps Mr. Brown can tell us something about that.

Mr. Brown—We have not experimented with excessive pressures anywhere near those you mention, but we did go through that pretty thoroughly with the standard lamp and mantles a few years ago, up to pressures of 9 and 10 inches. We found the ordinary type of Welsbach mantle would stand that pressure, and, up to the point where the mantle ruptured, we got a higher number of candles per foot or higher efficiency as the pressure increased. It was elected that we would, but I imagine the limit would be somewhere about 5 inches, on account of the life of the mantle. We did not go into it thoroughly enough to enable us to set a definite limit, but we get better results the higher we went or until the pressure ruptured the mantles.

The President—Is there anything else to offer?

Mr. Brown—This subject is important, and inasmuch as there is great agitation all over the country for the regulation of pressure, I think it should be brought out at this meeting, particularly in answer to these questions respecting the assertion that economy in the use of any blue flame apparatus will be greater with a high pressure than with a lower one, provided the mixing apertures are properly adjusted. The trouble with the consumer is from pressure, which is high at one time and too low at another. It can't be too high for his purpose. None of us distributes gas at too high a pressure for the consumers' use if we could keep that pressure even. If the aperture is properly adjusted the consumer will get better efficiency, more perfect combustion and greater satisfaction in every way than with the lower pressure. The complaints are caused by the fact that that appliance must be adjusted to the lowest pressure, otherwise the consumer gets no satisfaction at all. When the higher pressure comes on one burns too much gas. That is the whole thing. I think we should strive to have it understood by the consumers that high pressure does not mean excessive consumption of gas, but rather that irregular pressure does in every case, because the appliance must be adjusted to give sufficient at the lowest pressure; wherefore at the higher the supply is too great, and they will burn too much gas.

Mr. Haseltine—Recently in a certain place in the State I saw where a normal pressure of 32 inches was carried. I would like to know if any of the gentlemen ever had any experience with pressure as high as that, and what efficiency was obtained therefrom?

Mr. Humphrey—I can't answer that question from the point of efficiency, but I can from the point of satisfaction. In our Company (ours is a small town) the pressure has been carried at 31 to 32 for the year round, and it has given considerable satisfaction; but if we drop that to 28-tenths we hear from it immediately. The arcs, stoves and household burners all operate better at 32 than 28. The consumption per meter, however, is higher than it would be at 28.

Mr. Walker—Does Mr. Humphrey, under that high pressure, find it necessary to have an entire reconstruction of the mixers and gas adjustments from the ordinary lamps and stoves?

Mr. Humphrey—They probably were adjusted at first to meet that pressure and always carried that pressure.

Mr. Walker—Are the mixers the same on the Welsbach as the form we have in Milwaukee?

Mr. Humphrey—Yes; we made no specifications. Also, on the stove.

Mr. Haase—In refreshing my recollection about the stoves spoken of, not all burners noted in those tests referred to showed an increase in efficiency as the pressure increased. I remember some of the burners weren't capable of adjustment so that at the higher pressures they showed a higher efficiency.

Mr. Brown—That is true. I meant to bring that out. I spoke of the better class of burners, like the Welsbach; but I might say that with some of the cheaper ones we tried the mixture got worse the higher we went, and as we weren't able to get complete combustion, the result was a diminution of efficiency as we went up in the scale of pressure. Another point in connection with gas at a high pressure that was attempted to be brought out, is that a certain appliance will reach its best efficiency at a certain combustion of gas or heat, and you can't go beyond that without developing too much heat for the appliance. Of course if your pressure is excessive it means that the orifice through which the gas is passed into the mixer must be extremely small. When you get up where they use so many *pounds* of pressure as in England, those orifices are so small that the slightest foreign substance will put the appliance out of business. And it is a delicate matter to clean them. The high pressure orifices on some of these appliances are as small as the point of a fine, cambric needle, and you can easily see how little it will take to put them out of business.

A Telegram.

The President—Gentlemen of the convention: We have just received the following telegram: "Our best wishes for a good meeting. American Gas Light Journal." [Applause.]

If there is no further discussion on this matter of the best pressure for burners, we will proceed to a discussion of Question No. 13:

> "What is the best method for locating leaks when the mains are laid in clay soil?"

Has anyone had any experience? Mr. McAdam, I think you will have to open the discussion on this question.

Mr. McAdam—I don't see any plan to locate them other than to drive bar holes. You couldn't get a better soil than clay for that.

Mr. Cutcheon—A method quite successfully used in the summer time, is to run along the line of a main and look at the grass along the boulevard. [Laughter.] I would like to ask a question of Mr. McAdam about the indicator locating gas leaks into clay.

Mr. McAdam—I believe I heard about such a thing some 15 or 20 years ago, and I think Mr. Glass knows something about it, and I think he proposed that gas leak indicator a good many years ago to the Milwaukee Gas Light Company.

Mr. Glass—I don't know anything about it, I am sure.

The President—The Secretary informs me that there is an apparatus on the market for this, and it seems to me that someone who has used it, or the agent of the appliance, might give us information.

Mr. M. T. Walker—We have one in our office. I will make the gentleman a present of it. It shows a leak wherever you go, every time.

The President—I think if you had a meter on that it would be all right. [Laughter.] The next question submitted here is:

> "What is the most profitable source of revenue per meter to a gas company, light, fuel (domestic or industrial) or power, investment and maintenance charges considered?"

Mr. M. T. Walker—I put that question for the purpose of getting an expression from these gentlemen. To my own mind, it is not a question for argument. The results obtained in Milwaukee would evidently point to industrial as certainly the largest source of revenue per meter, the cost of maintenance and everything else being taken into account. It is easily seen from one class of apparatus which we have in use here. I have put in a great many in the last 2 years. That is, in hotel work, where we have one meter for the entire consumption of the hotel, or restaurant, or whatever class of business it is. Taking 25 meters for a basis out of the bunch, on an average right straight through, we had an average consumption of 400,000 cubic feet per year per meter, as against the consumption of the ordinary domestic range of 20,000 feet per year, which would make one meter give us a return equal to 20 times the domestic consumption. To my mind this would almost settle that question. If any gentleman found he could do better as an average on light or power I would like to know it.

The President—Mr. Walker has evidently settled that question in his own mind, and possibly it is the prevailing opinion of the convention, but we should like to hear somebody that has suggestions to offer "agin it," as they say.

Mr. Haase—To keep up the discussion, I might note that the gas range requires but a small meter, and the installations he refers to probably required a very much larger meter, so that the income per dollar of investment might nevertheless not be much greater in the one case than in the other. Perhaps he can illustrate that point a little further.

The President—It should also be considered that he is interested in promoting that kind of appliance.

Mr. Brown—Now, don't let him walk away from us. I don't think it makes a bit of difference what the consumer uses it for if he uses it a sufficient number of hours in 24. That is what we are interested in. I think Mr. Walker put his question in the wrong way, for I don't think what it is used for makes any difference, provided enough is used, and for a length of time in the 24 hours spread out.

Mr. Walker—The point I tried to make was that industrial work to a great many of the companies around the country is certainly new, and that in Milwaukee we have had a little more experience than a great many of the others. There is no question about it in my mind, in a great many of the smaller towns, and even at a higher price for gas than what we are charging to-day, that if they gave that part of the business one-half of the energy that they naturally give to domestic consumption, they could increase their returns very largely with it.

Many of our small towns, and especially through sections of Illinois contiguous to Chicago, are blessed with factories which are burning gasoline for fuel in small appliances, and if they could be induced to take gas from the local company you would find in many cases that that one consumer would be a great many times the value of any other consumer they had in the city. It was only to bring up the importance of that end of the business to the gentlemen present that I asked the question.

Mr. Crawford—Regarding Mr. Walker's remarks on that question, we have now one consumer that it took us about a year to get. Solicitors, clerks, general manager and everybody else talked to him off-and-on. He displaced a gasoline engine, and he is now using something like 200,000 feet. All we had to do was to run a short service, which we ran free, of course. But it looks like a pretty good consumer as compared to lights or stoves.

Mr. Cutcheon—I would like to ask Mr. Walker, who has had a good deal of experience, or any of the gentlemen connected with the Milwaukee Company, at what price you have got to sell gas in order to keep in proportion with the price of coal at $8; to hotels, for instance?

Mr. Walker—I don't know whether we have or not displaced much hard coal here, but we are operating now on one special range for a slightly less cost than the cost of soft coal at from $3 50 to $4 a ton and the cost of attendant labor. The bills for that party have never been, since that installation was made (about 2 years) quite as high as his coal bills and the cost of attendant labor were. I could instance many others if I had the record here to pick them out. Now, if we can do it in one place we can do it in others. Of course it varies a little with the class and amount of work being done, but we have so far been enabled to put in over 100 hotel ranges in the last 2 years, that are working successfully. They are paid for, the parties are paying the bills and are satisfied.

The President—What style of hotel range are you putting out chiefly?

Mr. Walker—What is called the ventilated top range, with lateral burners.

Mr. Haase—I do not know whether that which Mr. Walker has wanted to bring out has been heard. We want to bring out distinctly that the class of business referred to by him particularly was much more profitable than most any other kind of business. He refers to that particularly—his mind was particularly on the hotel and restaurant business—and that is much more profitable than other industrial business, for the reason that instantaneous demand is not much concerned with the total consumption. I don't know just exactly what the comparison would be, but I think the average registration per month of a 45-light meter supplying gas for hotel and restaurant purposes would be equivalent to a registration of about 100 or 150-light meter for gas engine purposes. I think he wanted to bring out that the gas engine installation would require a very much larger service pipe and meter than would a hotel and restaurant installation, giving the same revenue in gas used per month; is that not so?

Mr. Walker—That is about the idea; yes

Mr. Haase—Referring further to the cost: I want to have some of the gentlemen substantiate what I say, or correct me if I am wrong. It seems to me we have displaced the use of hard coal, and if I am right the bare cost of the fuel was not more than 10 or 15 per cent. greater for gas than for hard coal, in one instance that I know of and in which I am acquainted with the figures. Am I right, Mr. Rutledge?

Mr. Rutledge—Yes. We followed up closely one of the first installations put in, and the gas ranges were in competition with hard coal at $7.50 per ton. The average price for the gas that we were receiving was 75 cents. A variation of 10 per cent. one way or the other, would be the cost of operating the two fuels, sometimes one way, sometimes another. We found that those figures held good in practically all the cases we have so far encountered. In the same connection, we found that the maintenance of the gas range was considerably less than the maintenance of the coal range; consequently there has been a saving in favor of gas on maintenance which places the business practically in our hands.

Mr. Walker—The competition with hard coal has been very much easier on the small installations than on the larger. This is very evident from the fact that in a boarding house where they are feeding 20 to 40 people, the fire box in a coal range would be filled just about as long as it would be in a larger restaurant, where they close at 8 o'clock.

A Member—Not an all-night one?

Mr. Walker—Running all day, serving meals as the case would require. So that on the smaller installations you can compete more easily than on the larger ones.

On motion of Mr. Patton an adjournment to 10 A.M., of the following day, was ordered

(To be Continued.)

[Concluded from page 973.]

The Production of Coke and Its Application in Domestic Fires.

[Read by MR. PAUL SCHLICHT, Society of Arts, London.]

Kinds of Coke.—To the layman the word coke is a name applied to a product of the gas works generally that has never been held in high esteem by those who use it, those who make it, or those who have heard of it; but this has been due in part to the ignorance of the best method of using it. Its porosity makes it bulk for bulk inferior in calorific value to the coal from which it is made, but of greater radiating power if properly used.

As has been seen, the bee-hive coke is very wastefully made, to the discredit of two such great industrial nations as England and the United States, 90 per cent. of the metallurgical coke being still produced in bee-hive ovens. The by-product oven is coming into favor with the progressive iron masters of England, Bell Bros. Ltd., for instance, having done much to popularize by-product coke. In the late C. Lowthian Bell's paper read a short time ago before the Iron and Steel Institute of Great Britain, his favorable conclusions are given. I am greatly indebted to Sir Hugh Bell, the present head of the company, Greville Jones, Works Manager, and Dr. J. A. Roelofsen, Manager of the by-product plant, for valuable assistance in making tests with American coals.

If comparisons are carefully instituted between bee-hive oven and by-product cokes, it will be found that chemically the constituents are practically identical. Considered physically, the hardness and effective porosity of the latter make it certainly equal, if not superior, to the former. The silvery color of the bee-hive coke, due to a graphitic coating believed to protect the coke from dissolution by the hot gases of the blast furnace, is made up for by greater hardness and a more uniform porosity in the by-product coke. So great, however, is prejudice, even at this late day, and in the light of what is being done by the foremost iron masters, that important industrial centers in England are still prejudiced against the use of by-product coke. In both cases the volatile constituents of the coal are either driven off or a portion thereof deposited to add to the bulk of the coke; in the one case, however, these gases are generally driven off into the open air and wasted, in the other they are saved. The fact is that, even if 1 per cent. of volatile matter should exist in bee-hive coke, it would be considered a disadvantage. The essential differences, therefore, in the two cokes is largely imaginary. In Germany and Belgium, with inferior coals to those of England and the United States, there are no bee-hive ovens, and the amount of iron produced per ton of coke, considering impurities in the ore, is authoritatively claimed to be greater than in England and the United States, a claim, however, that I have not had the opportunity of verifying.

In the modern by-product oven with improved uniform continuous heating systems, cokes of varying degrees of hardness and inflammability can be produced in periods varying from 18 to 24 hours.

The gas retort coke made by nearly every gas company making coal gas, is used for heating, steam raising and the production of water gas, and, in London, in the cement industry. On account of its porosity and lack of uniformity it does not possess the fuel value, burned in the ordinary way, that it does burned with proper draft and special coke stoves, but grates have been constructed, and a furnace designed for burning coke with a long flame, invented by George Wilton, formerly an officer of the Gas Light and Coke Company, now Managing Director of the Chemical Engineering Company, which finds much favor with gas companies, and is capable of general application.

Application of Coke in Domestic Fires.—Sir William Siemens devised a system of burning ordinary porous retort coke in an open grate, in combination with gas, and introduced quite a number of these fires. Owing to lack of density of ordinary retort coke, I have been told, it has not found favor generally, the coke occupying nearly twice the space of ordinary coal, presenting disadvantages to the user not made up for by its advantages of smokelessness and of greater radiating power. Improved coke, of course, overcomes the objection to bulk.

The late Sir Charles Cookson, in a paper entitled "Smokeless London," described his use of gas in combination with anthracite and coke, showing conclusively the cheapness of gas for lighting fires in the place of wood, etc. Improved coke would, as a matter of course, work more effectively in this combination, which is simple and inexpensive. Grates and stoves made by several British manufacturers appear to be also well-adapted to the burning of improved coke, and from what I have seen of them in the burning of ordinary retort coke, I am of the opinion that they will work successfully. In the United States I have

secured results both with ordinary retort coke and by-product coke that indicate that the physical and chemical change from raw coal to coke is a most advantageous one if the coke is properly burned. Coke in blast furnaces took the place of charcoal and pit-coal, revolutionizing the production of iron. I am confident that improved coke for domestic fires will revolutionize the fuel and gas industries.

The Royal Commission on the Coal Supply recommends central heating as a means of economizing fuel. I beg to submit that coke fires can be kept all winter with a very small expenditure of fuel in simple central heating systems that would keep ordinarily cold passages and rooms comfortably warm. The circulation of air in our dwellings should be as uniform as the circulation of the blood in the body of healthy persons. Nations that insist on this are neither weak nor unheroic, and they have more days of real comfort than the less favored, and are not obliged to go to the sunnier climes as frequently. Architects and heating and sanitary engineers are justified in studying this question. The German—those Yankees of Europe—are beginning to advise central heating on the score of economy. With improved coke and proper coke burners the efficiency of central heating systems will be much improved. Public and office buildings, apartment houses, churches, theaters and schools could be cheaply and comfortably heated with these central coke fires. The question will naturally arise, will the change of fuel—raw coal to improved coke—overcome poor grates, badly constructed chimneys, etc. No, but those interested in selling improved coke should be sufficiently interested—and will be—to render assistance in remedying any conditions unfavorable to the burning of new fuel.

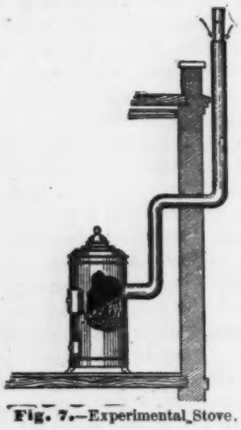


Fig. 7.—Experimental Stove.

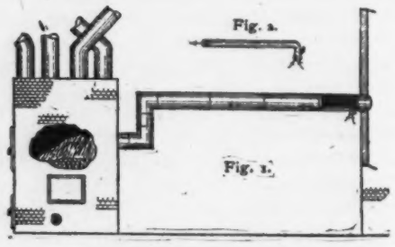


Fig. 8.—Steward Furnace.

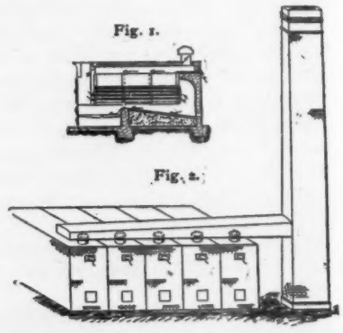


Fig. 9.—New York Quinine and Chemical Works.

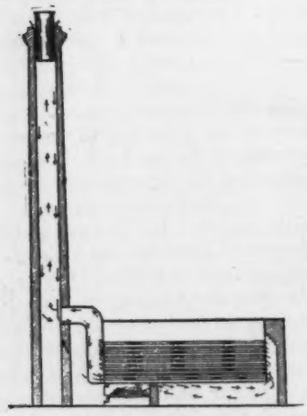


Fig. 10.—Steam Boiler with Air Inspirator.

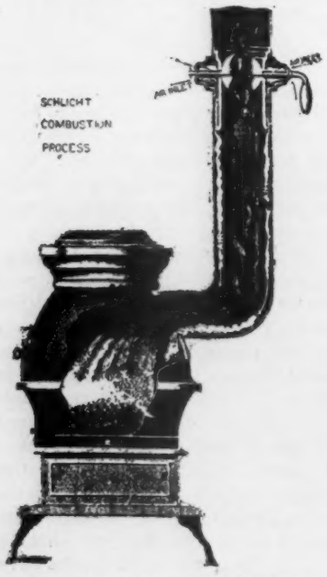


Fig. 11.—Coke and Anthracite Stove.

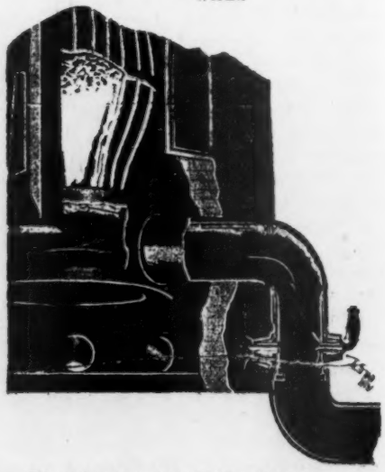


Fig. 12.—Central Air-Heating Coke Furnace.

New Method of Combustion.—I shall now touch upon a new method of combustion, the principle of which I have succeeded in applying to chimney improvement and to coke burning devices, and is also readily applicable to kitcheners, grates, steam boilers and locomotives for improved coke utilization.

In 1894 I made the discovery that in the accepted theory of chimney drafts certain factors had not been taken into account, for I had produced results regarded as paradoxical in view of Péclet's theory, the law of diffusion, and Tyndall's classic experiments on the diathermancy of air. My presumption was rewarded by prompt rejection of the Patent Office of my application for a patent on the ground that a patent cannot be issued to an inventor for "what to him is purely speculative," but that if I could establish my proposition by the testimony of disinterested experts or make a demonstration at the Patent Office, I would be entitled to broad claims for a new art or process of producing combustion.

The insufficiency of the current chimney draft theory to explain the phenomena occurring in the closed stove shown on the screen is evident. This stove, as will be seen, is connected to a round sheet iron smoke pipe, about 6 inches in diameter, and including joints, 25 feet in length. The smoke pipe passed through an opening in the side wall of the building in which the experiment was carried on and extended some 30 inches above the roof where observations could be taken. A tube extending about 18 inches into the smoke pipe and 18 inches outside was centrally supported in such a way that an annular space equal to about 25 per cent. of the area of the smoke pipe surrounded this short pipe. All the joints of the smoke pipe were carefully cemented with asbestos cement as were also the joints and cracks in the stove; the fire was started in the usual way before the lower door was cemented up. The fire burned brightly for 26 hours and the economy in anthracite roughly considering comparative temperatures was fully 50 per cent. The observations made by me of the products of combustion passing out of the top of the short tube, and the descent of air through the annular space, indicated that experiments I had previously carried on with a small-sized cooking stove and a short chimney justified my contention that air and combustion products could be caused to flow in opposite directions in the same flue or chimney, the down flowing air absorbing heat from the outgoing products of combustion, whereby the oxygen of the air more effectually acted on the combustible elements of the fuel in the place of combustion.

The Chief Examiner of the division of calorifics of the United States Patent Office, after witnessing demonstrations of the two oppositely moving currents, asked me to design a simple apparatus to carry out my process in his furnace.

The drawing I now show on the screen is a representation of Mr. Steward's hot air furnace, which required 1 ton of coal per week prior to the application of the little air tube to carry out the new principle I had discovered. This quantity of coal thereafter sufficed for 32 days to keep the house warm. This test was followed up by a number of others

which convenced Mr. Steward of the validity of my claims. Mr. Steward's high standing as an engineer and patent expert proved a great boon to the new invention. Subsequently, Professor Frederick H. Hutton, Professor of Mechanical Engineering in Columbia University, and Secretary for 25 years of the American Society of Mechanical Engineers, and Professor Morton, President of the Stevens Institute of Technology, as well as Dr. George H. Benjamin, American representative of the late Sir W. Siemens, gave the invention their warm approval.

The New York Quinine and Chemical Works' boilers embody the same principle. I now show them with others to illustrate applications of the new principle.

It is perhaps due, primarily, to the late Russell Sage, of New York, who was largely interested in the gas business, and who saw in my improvements means for the better utilization of coke for heating, that I seriously turned my attention to a study of the various systems of gas making in the United States. But it was James W. Ellsworth, a large colliery owner, who first clearly saw the significance of the by-product oven in its relation to the gas and fuel industries, and who, after I had had to do with the testing of his coal in Otto-Hoffmann ovens actively encouraged me in going deeply into the whole question of coal distillation, and especially coke utilization. Mr. Ellsworth personally made tests with coke for domestic heating with apparatus that I designed and estimated his saving over the best anthracite coal as reaching fully 40 per cent., proving that the supply of heated air furnished on top of the bed of fuel was even more favorable with coke than with coal.

This merely tentative experiment I followed up by a series of experiments in a laboratory I had fitted up for the purpose and in actual use for heating. All these tests show that with my method of supplying heated air on top of the fuel instead of cold air underneath, coke, both retort and by-product, could be made superior fuels to the best anthracite.

I believed, therefore, that I had achieved something that bore the same relation to coke that the gas stove bore to gas and subsequent confirmation has been recently secured.

In kitchen stoves there is a great waste of coal. They also make their full share of smoke. The gas stove has greatly obviated these fuel wastes, but in millions of homes raw coal continues to be used. The improved coke I have described if burned properly should produce not only greater economy, freedom from smoke, but also higher efficiency, particularly with this new process of combustion which is well adapted thereto. For the homes of the poor and those who cannot afford the luxury of open fires my process will save 50 per cent. in fuel in ordinary stoves. In the burning chiefly of anthracite in and about New York there are some 30,000 installations of apparatus embodying my principle.

I have frequently but reluctantly accepted invitations to read papers dealing with the use of coal from learned and inquisitive bodies in the United States—papers designed chiefly to promote discussion and question asking—a highly developed American trait as some of you are doubtless aware; but in undertaking the task of reading a paper before the Society of Arts, whose audiences are wont to be addressed by men of rare gifts and deep learning, I have had grave fears indeed, lest my humble and unconventional efforts might suffer too much by comparison with more exhaustive and scientific discourses. But, supported as I am by warm friends and the enthusiasm of conviction, I feel bold and strong in my zeal for the cause I am advocating, and I unhesitatingly predict that within 5 years the logic of events will bring about such reforms in the use of coal, that England instead of being the most spendthrift of nations—considering her coal supply—will reach the highest economic standards and provide the spectacle of a "Smokeless London."

I desire to express my heartfelt obligation for the courteous treatment and broad-minded encouragement I have received from Mr. Corbet Woodall, Governor of the Gas Light and Coke Company; Mr. Watson, the General Manager; Mr. Goulden, the Chief Engineer, and Mr. Goodenough, the Chief Inspector; also to Herr Paul Liebert, of Berlin, Managing Director of the Oberschlesische Kokswerke and Chemische Fabriken Actiengesellschaft, and Herr Altpeter, Local Director of the Zarbze Works; to Monsieur Brichant, Managing Director of Evence Coppée; F. J. Collin, Dortmund; and Directors Holbeck and Schmach, of the Actiengesellschaft für Kohlendestillation, Gelsenkirchen, for the privilege accorded me of testing coals in their ovens.

THE acetylene gas plant, which was constructed in Jasper, Mo., in 1905, by Messrs. Shopp and Harrison, for the purpose of supplying the settlement from a central station, was badly damaged some days ago, by an explosion which completely wrecked the generating apparatus.

Boiler Repair Toggle Bolt.

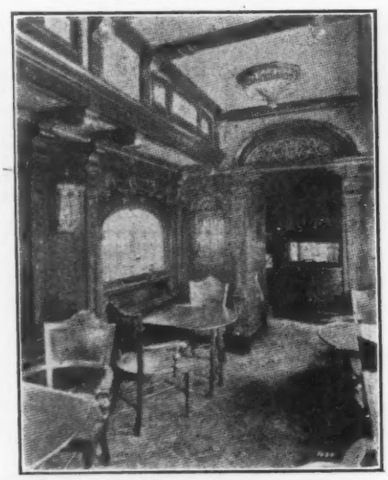
The Steward & Romaine Manufacturing Company is sponsor for the clever mechanical device shown in the illustration. It is intended for

the use of plumbers and steam heating contractors in making a temporary repair to a leaky boiler, when it is not convenient to replace with a new one at once. The bolt consists of a steel toggle bolt with a rubber and a galvanized iron washer on it. In use the toggle head of the bolt is pushed through the leak hole, which is enlarged to receive the bolt, and then drawn up tightly on the inside. The bolt then has rubber washer placed next to the outside rim of the boiler and the galvanized washer next to the nut. The nut is then screwed up, pressing the iron and rubber washers onto the outside of the boiler, making an excellent temporary repair. It is explained that in some cases plumbers have allowed the temporary bolt to remain for a long period until another leak took place.

The Evolution of Railway Car Lighting.

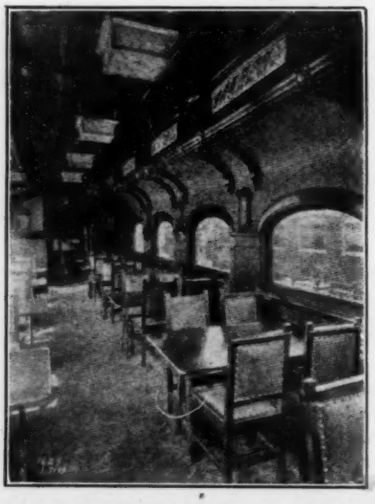
By MR. GEORGE W. PEARCE.

The story of the development of the art of gas illumination of railroad cars occupies an important chapter in the annals of illuminating engineering. This member of the sisterhood of arts devoted to the manufacture and distribution of artificial light did not spring at one bound fully organized into the world, but was developed by toilsome steps and slow, and at large cost. The superb examples of the latest forms of the application of compressed gas to car lighting that are shown in the illustrations embody the results of the genius and skill of

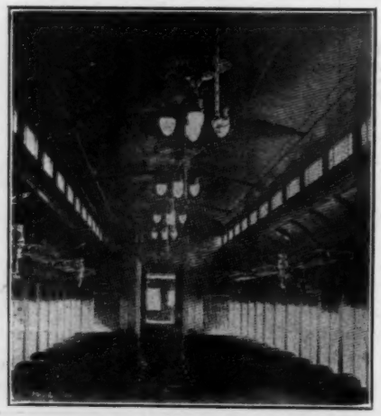


Cafe Car: 100-Candle Power in each Fixture, Compressed Gas, Inverted Mantle Burners.

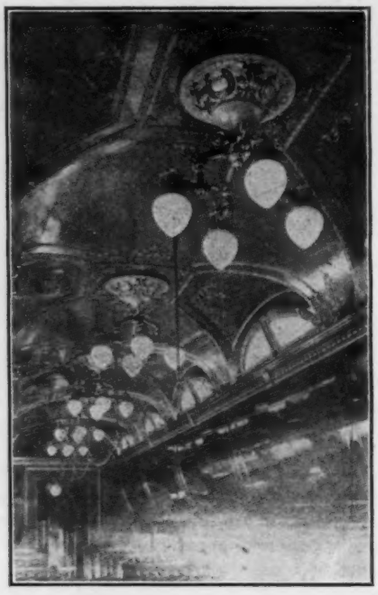
a number of illuminating engineers, whose work in that field has extended through almost 30 years, and which has been achieved at the cost of millions of dollars expended in experiments never ceasing, and in the displacement of types of apparatus of yesterday to make way for the better designed apparatus and appliances of to-day. All fields of illuminating engineering have been developed, in considerable part, by the use of inventions and discoveries of engineers and chemists, who, working in widely separated branches of physics, have within a century annihilated distance, sending the steamship against the wind at the velocity of 23 knots an hour, driving the locomotive at 9 times the speed of Peter Cooper's first locomotive, girdling the earth with a quicker method of communication than was conceived by Puck, and thereby making New York and Hong Kong nearer together than New York and Brooklyn were 70 years ago. These men and their co-



Dining Car: Four Compressed Gas Inverted Burners in each Ceiling Fixture, 100-Candle Power per Fixture.



Fixture with 4 Inverted Incandescent Gas Burners of 30-Candle Power Each.



Latest Pattern of Car Lighting Fixture used by the Pullman Company. One Double Mantle Inverted Gas Burner in each Stalactite.—Total Power 120-Candle Power each Fixture.

workers in physics who have added immensely to the advance of civilization in a thousand fields of the application of science to man's every day needs, in extending the range of the human vision, in delving into the mines of chemistry, and, in burrowing for the hidden treasures of engineering, made discoveries that have enabled illuminating engineers to light the night with almost the splendid effects of the meridian sun.

The art of gas engineering for house lighting, without which the present day method of compressed gas illumination of cars could not be conducted in a practicable and an economical way, has a history that links with it some of the noblest names among the physicists of Europe and America; just as the story of the development of electric lighting cannot be fitly told without marshalling a host of names that shine as stars of the first magnitude in the firmament "Where is the choir invisible; whose music is the gladness of the world."

Germany is the native country of the Pintsch compressed gas system in world-wide use for lighting railway cars, buoys and beacons. The early forms under this system came into use on several Prussian railways about 30 years ago. According to reports made upon the system as then installed, as set forth by prominent civil engineers from France, Great Britain, and this country, it was notably defective, and was maintained in use only because important German officers of state were financially interested in the project. About this time several gas lighted trains were in service in this country. The gas was taken from street mains and distributed by imperfect methods through ordinary types of 2-light sleeve pendants, fitted with fish-tail, lava-tipped burners, and shaded by 5-inch opal globes. Draughts and counter draughts often extinguished the lights, at which times the odor of the gas nauseated passengers; and when the gas was burning the light was flickering, and shadows were cast, so that the degree of value of the lighting system was far below that of the types of kerosene lamps made with especial reference to railroad requirements.

About that time Colonel William St. John became interested in the business of introducing compressed gas for car lighting. He is to-day what he was nearly 30 years ago, an illuminating engineer of the first rank; and to him as much as to any other man in North America is due the great measure of success which is to-day the portion of the Pintsch Compression Company in having a business whereby 400,000 barrels of crude petroleum are converted into gas for the lighting of 31,900 cars traversing the railroads of North America.

This great achievement by an American industrial corporation has been brought about since 1880, in which year a small hand compressing plant was built near the Bergen tunnel in New Jersey for the purpose of lighting a few cars on the Erie Railway. Shortly afterward very active competition developed for passenger business between the rival Sound lines, conducted by the Old Colony Railroad which controlled the Fall River Line, and the Boston and Providence Railroad, which operated the Stonington Line. Both roads were operated by men about as near to the fossilized state of mind as ever kept behind the times in the railroad business. Both roads always fought off every man who came along with a suggestion for an improvement in service that would cost more than 10 cents. But so strong grew the competition between those lines that both jumped at the chance to advertise "gas lighted trains." The Boston and Providence put on a train equipped with compressed gas, and the Old Colony put in service two sumptuously furnished parlor coaches of the English compartment type and lighted them under an imperfect compressed gas lighting system. These cars were the wonder of the time in railroad circles; but it was years afterward before 5 per cent. of the country's passenger cars were gas lighted.

In the meantime the Pintsch Compressing Company was organized by a number of prominent and progressive capitalists. The late Colonel Arthur W. Soper, a high-class railroad man of indomitable energy, and one of the finest men the railroad business ever knew, was made the head of the company to push the business vigorously. The present President Humphreys, of Stevens Institute of Technology, became the first engineer of the company; and from the beginning to the end of his service he did great things for the uplifting of the business, whereby the Pintsch system as developed here far surpassed whatever was due to the work of the foreign engineers in the same field. Soon afterward Colonel Robert Andrews, an eminent engineer, formerly an officer of the Corps of Engineers, U. S. A., during the Civil War, became Vice-President of the company, and after the death of Colonel Soper became President. The First Vice-President, Mr. Robert M. Dixon, a graduate of Stevens Institute, and a member of the Society of Illuminating Engineers, is also the chief engineer and general manager of the company. The assembly of the illuminating engineers and the assistants thereto would crowd the noble hall in the Engineering Societies Building. When these facts are taken into consideration, one realizes that there is a large and learned body of men connected with the business of making gas for the lighting of railway cars, a business which the average man outside of illuminating engineering

probably classes as involving nothing more than the work of turning on a valve connected with a street main to a tank at the bottom of the car.

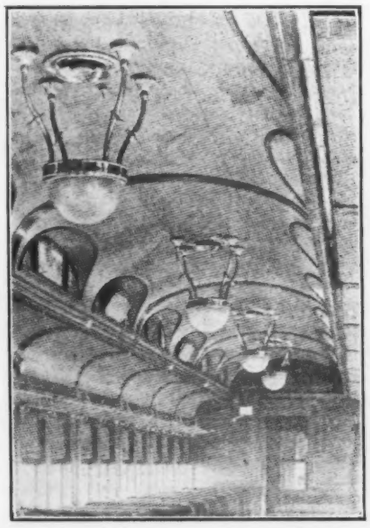
Through all the years and changes, Colonel William St. John, deservedly esteemed by engineers and railroad men the country over, has been on the firing line all the time—both for the lighting of cars and for gas lighted buoys and beacons. His illustrious namesake, St. John the Baptist, "crying in the wilderness," in all probability did not have a body of men deafer to new light than this missionary of gas lighting found among the hide-bound conservatives in the railroad business of years ago, who would not give their patrons better lights than the smoky, dirty, and vile smelling oil lamps of the patterns yet to be seen everywhere on the suburban lines of the Boston and Maine system, and in the antiquated horse cars that are operated in this city.

The main facts as to the manufacture of Pintsch gas are few. It is a dry fixed gas with a large percentage of carbon, and it possesses about thrice the illuminating power of the ordinary gas made by the corporations that supply gas through street mains. Street main gas when compressed yields but one-sixth of the illuminating power of Pintsch gas. Crude petroleum, or a rich distillate therefrom, is the basis for Pintsch gas. The conversion into a fixed gas is by fractional distillation, after which the product is cooled, washed and purified in accordance with the most advanced methods, after which the gas is stored in gasometers, from which it is drawn for compression by special types of compressors to the pressure of 14 atmospheres, after which the product is stored in gasholders, to be drawn upon as needs require for distribution through pipe lines laid at rail stations or in car storage yards. Under compression Pintsch gas loses not more than 10 to 12 per cent., whereas gas taken from street mains loses between 80 and 90 per cent. The steel tanks for the supply of gas that are affixed beneath railroad cars are tested to pressures so much higher than any strain that could come from gas that the practice tends to remind one of the saying of the great engineer, George Stephenson, "Make everything twice as strong as it need be." The automatic regulator, or gas pressure reducing valve, used for the Pintsch gas system is a remarkably efficient invention. This valve is placed under the car, so that no high pressure gas is taken into the car. With 10 atmospheres of gas in the receiver, there is the initial pressure of 150 pounds. The regulator reduces this so that the pressure of the gas at the burners is only 1½ ounces, so that no matter whether the pressure in the tank under the car is 10 atmospheres or 1 atmosphere, the reduction in pressure from the normal stage in any degree does not sensibly reduce the illumination from the lamps.

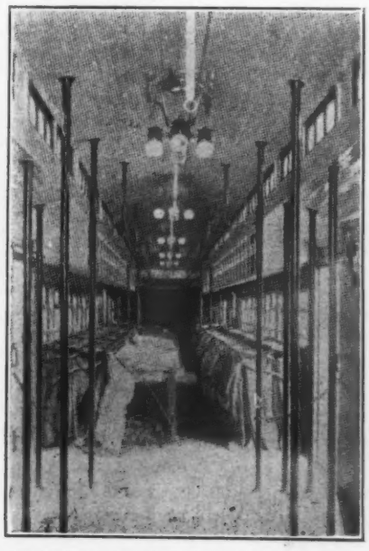
From the days of the first installations of this system there have been many changes in the types of burners, and in forms and decorations of fixtures. In the beginning, adaptations of the Siemen's patterns of regenerative gas lamps were used. To-day the lighting fixtures include inverted burners of the company's own special forms, and double incandescent mantles that represent an enormous cost to the company for experiments conducted through many years before success was achieved. The thorium nitrate, produced from monazite sand from Brazil, that is used in the making of mantles for railroad car lamps is much more costly than the ordinary compound used for the ordinary mantles of commerce. But notwithstanding the high cost of making and distributing compressed gas for car lighting the service is very cheap—half a cent an hour for a 60-candle power fixture fitted with double incandescent mantles. The cafe, sleeping and dining cars shown in illustrations contain 112 candle power in each ceiling fixture. There are now in use under the Pintsch system about 1,000 cars fitted with inverted burners and double mantles. The annual output of gas by the Pintsch Compressing Company is 720,000,000 cubic feet. The same kind of gas is used under the Pintsch system for the lighting of thousands of buoys and beacons. The buoys burn continuously day and night, with attention from light house department men not oftener than once in 3 to 4 months. The cost of gas for the types of buoys in New York harbor is less than 4 cents per buoy for 24 hours' consumption. Since the introduction of gas lighted buoys in a number of harbors ships enter and depart as freely by night as by day.

Fifty years ago, as it appears by official records, whale oil, mineral sperm, and camphene in ratchetless burner lamps without chimneys, afforded the illumination that served only to make light visible in 2,000 passenger cars in the United States. About 650 cars were lighted with candles. On no car was it possible for a passenger to read by artificial light, unless he carried, as was often the case with constant travelers, a lantern. Daniel Webster, when traveling by night between Marshfield and Boston, always had two double swing binnacle whale oil lamps fixed at the side of the car, which lamps were kept by the road solely for the great man's use. Horace Greeley, Ralph Waldo Emerson, Dr. Oliver Wendell Holmes, William Lloyd Garrison and Wendell Phillips, when traveling on lecture tours, always carried a well-made lantern for use as a reading lamp on cars and in hotel bed rooms. These are indeed the days of a good degree of the realization, in a physical sense, of the prayer of the great sage for "Light, more light," and they are remindful of the very last lines written by Longfellow:

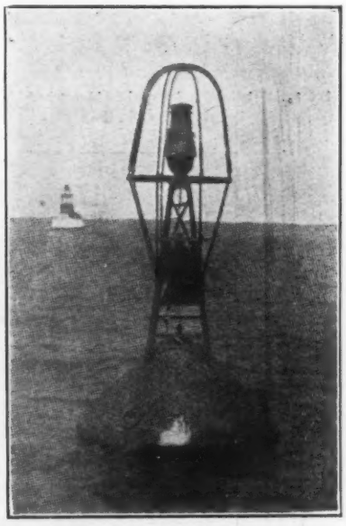
"Out of the shadows of night
The world roils into light."



New Pattern in Car Fixture; 20-Candle Power per Fixture—Double Mantles. Inverted Gas Burners.



Mail Car Lighted with Inverted Mantle Burners.



Gas Lighted Buoy; Same System as is Used in Car Lighting.

A New Lidgerwood Mast Hoist.

An electric mast hoist developed by the Lidgerwood Mfg. Company, New York, to meet some exacting modern engineering conditions is herewith illustrated. It is specially compact, containing as it does the electrical motor, controller and resistances, the two drums for operating the boom and fall lines of the derrick, all within reach of the operator. Fig. 1 is a view of the hoisting engine, while Fig. 2 shows it as installed for operating. This derrick was designed especially for preparing the foundations of the new terminal building in course of construction for the Hudson Companies at Cortlandt, Church, Dey and Fulton streets, New York. In preparing the foundations for several of the huge structures recently erected in New York it has been found

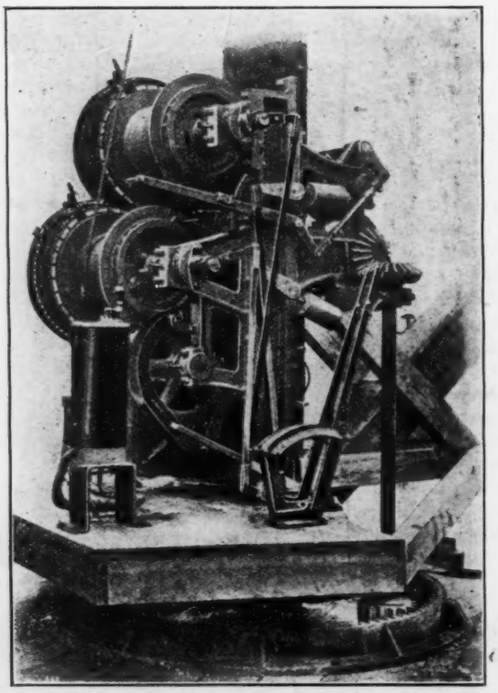


Fig. 1.—Hoisting Engine of the Lidgerwood Mast Hoist, Built by the Lidgerwood Mfg. Company, New York.

Fig. 2.—The Lidgerwood Hoisting Engine as Installed for Operating a Mast Hoist.

that where a number of caissons were to be sunk closely together it was necessary for rapid and economical working to equip travelers with derricks and to keep the dimensions as small as possible in order to allow for the use of a number of similar derricks within a limited space. The new Lidgerwood derrick goes far toward solving the problem and the one shown in operation has given good satisfaction.

A decided advantage of the derrick is that the operator has full control of every operation, including the application of power, while he stands constantly facing his work. The hoist meets the conditions for compactness as it eliminates the space necessary for the leads where full wheel derricks and separate hoists are employed, and it is adaptable for the operation of 2 booms mounted on a single traveler. The hoist is operated by a 250-volt direct current electric motor, and is also made to operate an alternating current with induction motors. It has a nominal capacity of 4,000 pounds lifted at a speed of 130 feet per minute. The drums, which measure 12 inches in diameter and 19¼ inches in width of face, are each complete with brakes, ratchet and pawl.

In addition to the regular brakes operated by foot levers, the hoist is fitted with electrical solenoid brakes, which in many cases are desirable for added safety. The solenoid brake is applied to the shaft of the electric motor, and when the operating current is turned on the motor it passes through the coils to the solenoid, lifts the armature and automatically releases the brake. When the current is shut off, or in case of its being cut off by accident, the armature falls and its weight sets the brake with power sufficient to hold the entire load of the hoist. According to tests made by the New York Edison Company in handling loaded buckets weighing 2,200 pounds, the derrick requires only ½ kw. hour of current to complete a cycle of operations, such as lifting a bucket out of a caisson through the air lock, raising the boom and swinging it through an arc of 45°, returning the boom to its original position and lowering the bucket to the bottom of the caisson.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

At the annual meeting of the Binghamton (N. Y.) Company the officers chosen were: Directors, E. E. Eysenbach, D. J. Hirschman, Geo. F. O'Neill, Geo. W. Dunn, J. T. Deyo, J. W. Manier, C. M. Stone, W. G. Phelps and E. McMillin; President, E. McMillin; Vice-President, James W. Manier; Secy. and Gen. Mgr., Robt. W. Manier; Assistant Secretary and Treasurer, A. P. Lathrop.

The following is the text of a resolution recently adopted by the City Council, Omaha, Neb.:

"*Resolved*, That we hereby pledge to the people of Omaha that unless a reduction in the price of gas is secured by July 1, 1907, we will at once pass an ordinance providing for the submission to the people of a proposition to vote bonds to build or acquire a municipal gas plant for the city of Omaha." Talk about big sticks! That of the President is only a pussy willow compared with the Councilmanic limb at Omaha!

The course of demonstration lectures on cooking by gas, given by Miss Rena Vawter, at the instance of the Light, Fuel and Power Company, South Haven, Mich., was successful in every respect. The lectures were given in one of the shops in Opera House Block, for five successive days, between the hours of 2 and 5 P.M.

The last conference between the executives of the Union Gas and Electric Company, of Cincinnati, and its discontented workmen, resulted happily. Under the proposed terms the retort house men are to be put on an 8-hour shift, and the rate of pay will be increased about 20 per cent.

A site for the proposed gas plant at Bessemer, Ala., has been purchased. It is at Eighth avenue and 21st street, on the line of the Louisville and Nashville Railroad, and Messrs. Harrison and Sly, the main promoters, assert that the plant will be in operation by September 1st.

Mr. Howard H. Crowell, the electric expert on the staff of the New York Commission of Gas and Electricity, has been retained by Mayor Thompson, of Detroit, to investigate the supply of electricity on public account to that city by the Detroit Electric Light Company.

A correspondent in New Haven, Conn., writing under date of the 8th inst., incloses the following: "After being in the service of the New Haven Gas Light Company for 32 years, Mr. James P. B. Ricketts has been retired on a pension. Mr. Ricketts, who was in charge of the power division of the plant, is 65 years of age, and his long and faithful service with the Company certainly well-merited recognition. As a farewell testimonial from his fellow employees, Mr. Ricketts was presented with a certificate of 2 shares of stock in the Company. The presentation speech was made by Mr. F. G. P. Barnes, on behalf of his associates. The gift was certainly a surprise to the recipient, who in a clever speech of acknowledgment, made many references to old-time happenings with the men and in the works, when New Haven was not the city that it now is. Messrs. James Dolan, R. P. Williams, John Stoddard, Chas. Matthew and F. G. P. Barnes conducted the workman's end of the affair."

This item is recited in connection with the argument over the finality as to whether or not the city of Philadelphia will terminate the lease for the operation of the Philadelphia gas works by the U. G. I. Company—it certainly is germane to the subject. On the 8th inst. Mayor Reyburn in his mail received a letter from the huge saw making concern of Henry Disston & Son, whose mammoth shops at Tacony, Pa., are perhaps unequalled for completeness in the world. In it the

saw makers complained that their supply of gas, which they obtained from the municipally-operated plant at the House of Correction, near Tacony, was altogether inadequate, and asked for the right to put down a main in the public roads which would enable them to hook up to the pipes of the U. G. I. Company, that pass through a section not far from the saw works. It is likely the permission will be granted. What seems queerest about this application is that the Disston folks do not construct a gas plant of their own, for it would more than likely consume at least 12,000,000 cubic feet per annum.

Messrs. Andrew Du Shane and George Kirkham, of South Bend, Ind., have applied to the Village Council of Cassopolis, Mich., for the right to operate there a gas supply under the title of the Cassopolis Gas Light and Fuel Company.

Mr. H. A. Quesbarth, of St. Paul, Minn., has been appointed Cashier of the Shawnee (Okla.) Gas and Electric Light Company, vice Mr. A. S. Hart, resigned.

The properties of the City Gas Company, of Beatrice, Neb., were sold at public sale under order of the special master, Mr. George H. Thummel, of Omaha, early this month. The plant was bid in at $30,000 by a committee representing the Eastern bondholders.

The Governor of Pennsylvania has signed the bill which requires that gas, electric light or water companies, before entering on or occupying any street or highway shall apply to the authorities for their consent before they may make such entrance and occupation.

The Anaheim Gas Company, of Anaheim, Cal., and the Fullerton (Cal.) Home Gas Company, have come to an understanding whereunder the latter will have control of the gas supply in Fullerton.

At the annual meeting of the Georgetown (D. C.) Gas Light Company the officers elected were: Directors, M. J. Adler, I. T. Brown, R. D. Weaver, Wm. B. Orme, Wm. A. Leetch, Geo. L. Nicholson and W. A. Mearns; President, George Howard; Vice-President, M. J. Adler; Secretary and General Manager, Robert L. Middleton.

At the sale of the property and franchises of the Temple (Tex.) Gas Company, which were disposed of at public auction on the 4th inst., the property was purchased by Mr. Frank Denison. The sale was really friendly in its nature.

At the hearing before the New York State Commission of Gas and Electricity, respecting the investigation into the lighting conditions of Saratoga, in so far as the Saratoga Springs Gas, Electric Light and Power Company is concerned therewith, the "expert," Mr. Alton D. Adams, was a shining witness "for the people."

We have information respecting the incorporation of the Northern Illinois Gas and Electric Company by L. D. Condee, E. J. Klose and B. G. Kuhn. It is capitalized in $250,000.

Mr. Henry Keyes, of Sacramento, Cal., speaking as General Manager of the Lodi (Cal.) Gas Company, said some days ago that the plant will be completed by October 1st. The expenditure involved in this construction is put at $70,000.

Mr. Wm. F. Miller has resigned his position as General Bookkeeper to the Dayton (O.) Gas Light and Coke Company, in order to engage in a new line of business connected with the building industry.

The Commissioners under whose charge the proposed gas works for Bellows Falls, Vt., are to be constructed, have opened books for the receiving of subscriptions to the capital stock. The books are to remain open until noon of the 9th prox.

An opposition concern to the Portland (O.) Gas Company has been incorporated by Messrs. E. E. Lytle, D. G. Tomasini and R.W. Colson. It is to be known as the Economy Gas Company, is capitalized in $1,000,000, and the following promises are outlined in the franchise under which it seeks to operate: It is agreed to that 95 cents per 1,000 cubic feet shall be the maximum price for gas and that not less than $5,000 a year shall be spent for the maintenance of the plant. It also provides that 1 per cent. of the gross earnings shall be paid to the city every year. The ordinance if approved will prevail for 25 years, at the end of which period the city will have an option on the purchase of the plant.

Residents of Macatawa Park are anxious that the Holland (Mich.) Gas Company shall extend its mains through their section.

The daily papers have just announced that the Astoria (N. Y.) Light, Heat and Power Company, which is to be the operative link in the Consolidated Gas Company, of New York, has decided to erect this summer 36 four-story buildings on the plot bounded by Merchant, Crescent, Wolcott and Winthrop streets, Astoria. Messrs. James E. Ware & Son have drawn the plans for the structures, and no mistake is made when it is said that no workmen of any other Company will be as comfortably housed as those of the Astoria Company. The scheme comprises an administration building, which is to hold the Company's offices, also club rooms and an assembly hall. The residences are to be of the flat order, and are to be mapped out in suites of from 4 to 10 rooms.

The Columbia Gas and Electric Company has leased the municipal plant of the Hamilton (O.) authorities, and will operate the same for a term of years, with a view to supplying natural gas to the residents.

At the annual meeting of the shareholders of the Hagerstown (Md.) Light and Heat Company the officers elected were: Directors, S. B. Loose, Albert Heard, J. C. Lane, G. B. Oswald and S. N. Loose; President, S. B. Loose; Secretary-Treasurer, Albert Heard; Superintendent, E. B. Spielman.

The Victoria (B. C.) Gas Company has planned an extension of about 5 miles to its main system that will approximate 25 per cent. of the present one. That looks like expansion.

A correspondent forwards the following from La Porte, Ind., under date of the 10th inst.: "Manager W. H. Hulswit, of the La Porte Gas Light Company, never allows an opportunity of booming La Porte to pass unimproved. The fact has been proven and patent before. He says he believes in the town and in its future industrial growth, and whenever he can convey his convictions to the people not privileged with citizenship in La Porte he does so. His latest plan is a new business envelope, in which all the outside correspondence of his Company will be carried. It is a striking envelope printed in two colors, red and black. On the address side above the Company card the word 'La Porte' stretches across the top in red letters. On the back the boom evangel is promulgated. On the upper flap is printed in black and red.

La Porte
The Best City
in
Indiana

while the lower flap carries this veracious legend:

"*Where We Shine* is in our manufacturing industries. We have many of them and they are so diversified we are never at a standstill. If one is quiet others are busy. We help each other, and everybody is happy. No 'kickers.' Plenty of work and lots of business.

Come and Join Us.
Factory Propositions Invited by the
La Porte Business Men's Club.

"On either side of the envelope's back are these civic statistics displayed:

3 Railroads	County Seat
1 Interurban Line	Pa Porte County
(2 more building)	4 Banks
15 Miles Paved Streets	Population
73 Miles Cement Walks	in 1907
34 Miles of Sewers	12,000
25 Miles of Water Mains	Population
20 Miles of	in 1910
Gas Mains	20,000

"A happy thought surely, and the message will be sent all over the land with its invitation. The first missionary envelopes were sent out to-day. The idea is not copyrighted and Mr. Hulswit suggests its adoption by all the business men and manufacturing firms in the city."

THE AMERICAN GAS LIGHT JOURNAL

A. M. CALLENDER & CO.,
PROPRIETORS.

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ELBERT P. CALLENDER,
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NOTIFICATION RESPECTING ADVERTISING.

Orders for new advertising, or for changes in standing advertisements, to insure attention in the issue following their reception, must be in hand any time of Wednesday.

AGENTS:

New York - American News Co., 39 and 41 Chambers St.
Germany -Lemcke & Buechner, of New York.
England -Aug. Siegle, 30 Lime Street, London.

MONDAY, JUNE 17, 1907.

The Market for Gas Securities.

Weakness was the dominant feature in local gas shares last week. Consolidated opened today (Friday) at 117 to 119, and the trading in it was at a standstill. The unseasonable weather is keeping the Consolidated and Brooklyn Union Companies up to their very best to supply the demand, which is a great many per cent. in excess of that last year. Brooklyn Union is also in the downs, the stock being quite freely offered at 112.

Peoples, of Chicago, is 89¼ to 90, and it is being taken for investment account quite freely. Massachusetts Gas Companies is 56 bid, despite the fact that is now pretty well settled that no change in the dividend rate will be made this quarter. The strength in Washington (D. C.) gas continues. The New Haven (Conn.) Company has declared the usual dividend of 2 per cent. for the quarter, and its earnings are showing marked increases.

Gas Stocks.

Quotations by George W. Close, Broker and Dealer in Gas Stocks.

16 WALL STREET, NEW YORK CITY.

JUNE 17.

☞ All communications will receive particular attention.

☞ The following quotations are based on the par value of $100 per share.

N. Y. City Companies	*Capital*	*Par.*	*Bid.*	*Asked.*
Consolidated	$73,177,000	100	117	119
Central Union Gas Co.—				
1st 5's, due 1972, J & J	3,000,000	1,000	101	104
Equitable Gas Light Co.—				
Con. 5's, due 1932, M. & S.	1,000,000	1,000	..	105
Mutual	3,500,000	100	190	235
New Amsterdam Gas Co.—				
1st Con. 5's, due 1948, J. & J.	11,000,000	1,000	98	100
New York & Richmond Gas Co. (Staten Island)	1,500,000	100	37	43
1st Mtg. Gold Bds. 5 p.ct.	1,000,000	..	98	104
Northern Union—				
1st 5's, due 1927, J. & J.	1,250,000	1,000	101	103
New York and East River—				
1st 5's, due 1944, J. & J.	3,500,000	1,000	108	111
Con. 5's, due 1945, J. & J.	1,500,000	..	104	110
Standard	5,000,000	100	140	160
Preferred	5,000,000	100	155	175
1st Mtg. 5's, due 1930, M. & N	1,500,000	1,000	104	108
The Brooklyn Union	15,000,000	1,000	107	112
1st Con. 5's, due 1948, M. & N	15,000,000		107	..
Yonkers	299,650	500	130	..
Out-of-Town Companies.				
Bay State	50,000,000	50	¼	⅝
" Income Bonds	2,000,000	1,000	..	75
Binghamton Gas Works	450,000	100	..	65
" 1st Mtg. 5's	500,000	1,000	95	100
Boston United Gas Co.—				
1st Series S. F. Trust	7,000,000	1,000	82	85
2d " " "	2,000,000	1,000	47½	50
Buffalo City Gas Co.	5,500,000	100	9	10
" " Bonds, 5's	5,250,000	1,000	75	80
Capital, Sacramento	500,000	50	..	35
Bonds (6's)	150,000	1,000	..	..
Chicago Gas Co. Guaranteed Gold Bonds	7,650,000	1,000	104	106¾
Cincinnati Gas and Electric Co.	29,500,000	100	98½	99
Columbus (O.) Gas Co., 1st Mortgage Bonds	1,500,000	1,000	90	..
Columbus (O.) Gas Lt. & Heating Co	1,682,750	100	87	88
Preferred	3,026,500	100	107½	108
Consumers, Toronto	2,000,000	50	200	204
Consolidated, Baltimore	11,000,000	100	..	90
Mortgage, 6's	3,600,000	..	..	118
Chesapeake, 1st 6's	1,000,000	..	..	..
Equitable, 1st 6's	910,000	..	..	..
Consolidated, 1st 5's	1,490 000	..	..	112
Consolidated Gas Co. of N. J.	1,000,000	100	15	17
Con. Mtg. 5's	880,000	1,000	92	95
Bonds	75,000	..	..	100
Detroit City Gas Co	5,000,000	50	..	50
" Prior Lien 5's	4,618,000	1,000	..	98
Detroit Gas Co., 5's	381,000	1,000	75	80
" Inc. 5's	16,000	100	98½	100
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1,000	..	101
Essex and Hudson Gas Co.	6,500,000	..	39	40
Fort Wayne	2,000,000	..	..	..
" Bonds	2,000,000	..	55	..
Grand Rapids Gas Lt. Co. 1st Mtg. 5's	1,225,000	1,000	104½	105
Hartford	750,000	25	190	200
Hudson County Gas Co., of New Jersey	10,500,000	..	110	112
Bonds, 5's	10,500,000	..	107½	108½
Indianapolis	2,000,000	..	60	70
" Bonds, 5's	2,650,000	..	104½	105
Jackson Gas Co	250,000	50	82	..
" 1st Mtg. 5's	290,000	1,000	97	100
Kansas City Gas Light Co., of Missouri	5,000,000	100	..	36
Bonds, 1st 5's	3,922,000	1,000	102	104
Laclede, St. Louis	10,000,000	100	..	05
Preferred	2,500,000	100	95	110
Bonds	10,000,000	1,000	104	104¼
Lafayette Gas Co., Ind.	1,000,000	100	..	60
Bonds	1,000,000	1,000	60	65
Louisville	2,570,000	50	143	145
Madison Gas & Elec. Co.				
" 1st Mtg. 6's	350,000	1,000	106	108¾
" 6 per cent. scrip, due 1910	100,000	25	16	51
Massachusetts Gas Companies of Boston	25,000,000	100	60	60¼
Preferred	25,000,000	100	83	83¼
Montreal, Canada	2,000,000	100	218	218¾
Nashville Gas Lt. Co	1,000,000	100	110	..
Newark, N. J., Con. Gas Co.	6,000,000	..	56	58
Bonds, 6's	6,000,000	..	137	138
New Haven	2,000,000	25	200	..
Peoples G. L. & Coke Co., of Chicago	25,000,000	100	89¾	90
Peoples Gas Lt. & Coke Co., Chicago, 1st Mortgage	20,100,000	1,000	..	..
" 2d "	2,500,000	1,000	104	..
Rochester Gas & Elec. Co.	2,150,000	50	88	..
Preferred	2,150,000	50	118	..
Consolidated 5's	2,000,000	..	104½	105¼
San Francisco, Cal.	15,800,000	100	..	..
St. Joseph Gas Co. 1st Mtg. 5's	751,000	1,000	92	..
St. Paul Gas Light Co	1,500,000	100	45	47
1st Mortgage 6's	650,000	1,000	113	116
Extension, 6's	600,000	1,000	112½	115
General Mortgage, 5's	2,465,000	1,000	96¼	..
Syracuse, N. Y.	1,975,000	100	50	55
Bonds	2,047 000	1,000	102	..
Washington, D. C	2,500,000	20	300	305
First mortgage 6's	600,000	..	..	..
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DIVIDEND NOTICE.

OFFICE OF THE UNITED GAS IMPROVEMENT CO.,
N. W. CORNER BROAD AND ARCH STS.,
PHILADELPHIA, PA., June 12, 1907.

The Directors have this day declared a quarterly dividend of 2 per cent. (one dollar per share), payable July 15th, 1907, to stockholders of record at the close of business June 29, 1907. Checks will be mailed.

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p_2 = absolute terminal pressure in pounds per square inch,
L = length of pipe in miles,
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(1.) Set the specific gravity of the fluid opposite the length of pipe;

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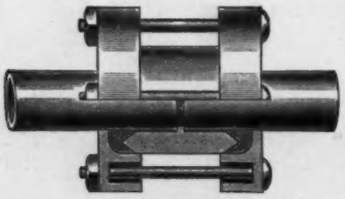
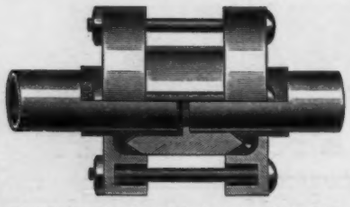
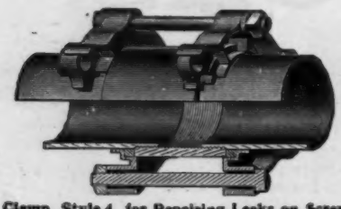


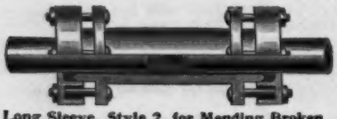
Regular Coupling, Style 1, for Plain End Wrought Iron Pipe.



Insulating Coupling, Style 5, for Plain End Wrought Iron Pipe.



Clamp, Style 4, for Repairing Leaks on Screw Collar.



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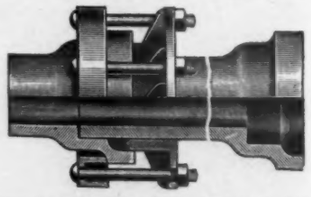
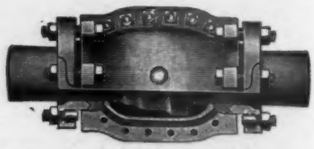
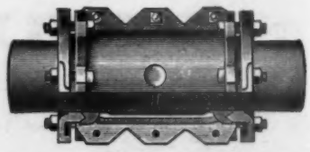


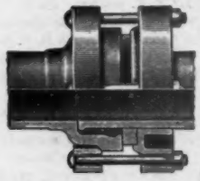
Coupling, Style 9, for Special Style Cast Iron Pipe.



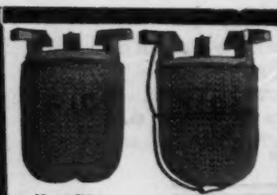
Split Sleeve for Repairing Broken Bell or Cast Iron Pipe.



Split Sleeve for Repairing Broken or Cracked Cast Iron Pipe.



Clamp, Style 4½, for Repairing Leaky Lead or Cement Joints in Cast Iron Pipe.



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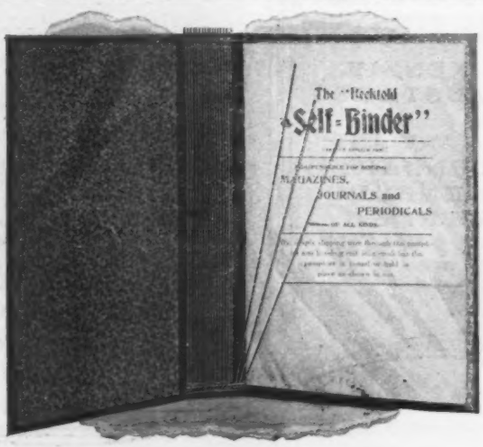

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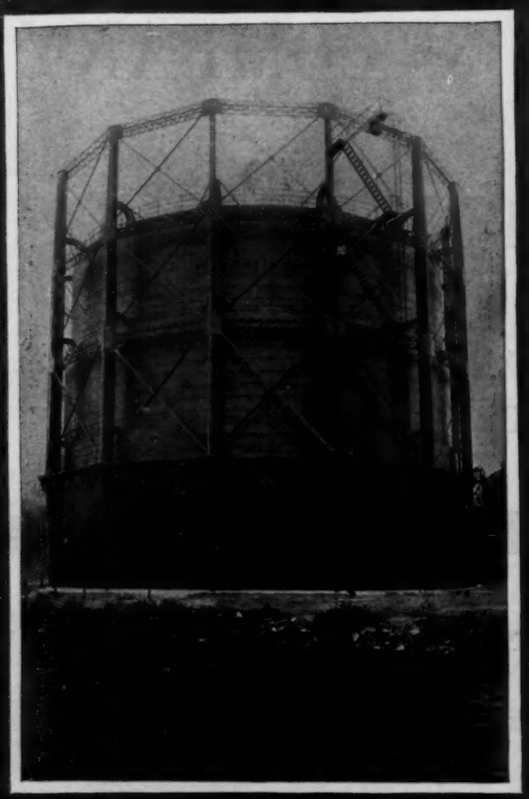

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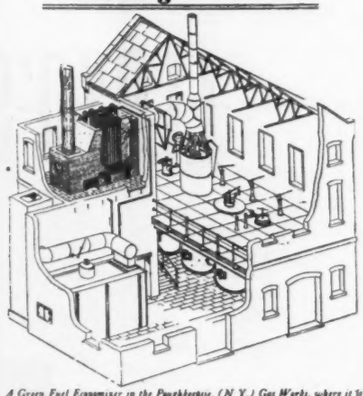

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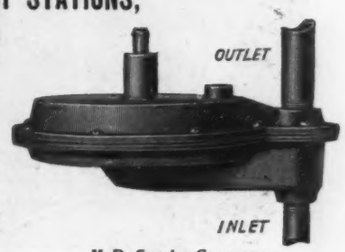

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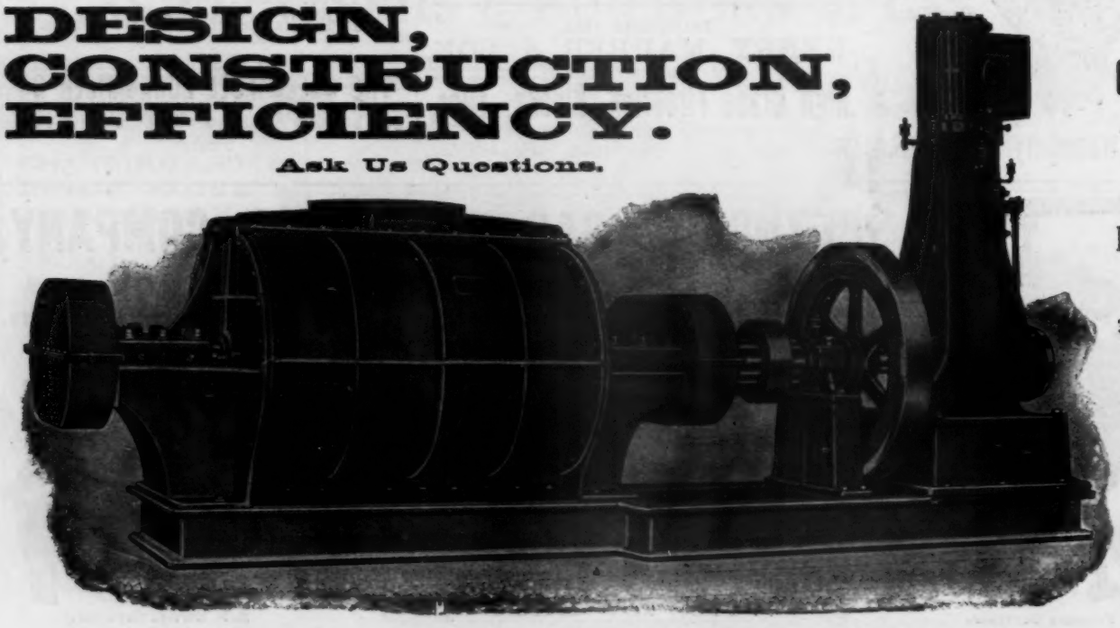

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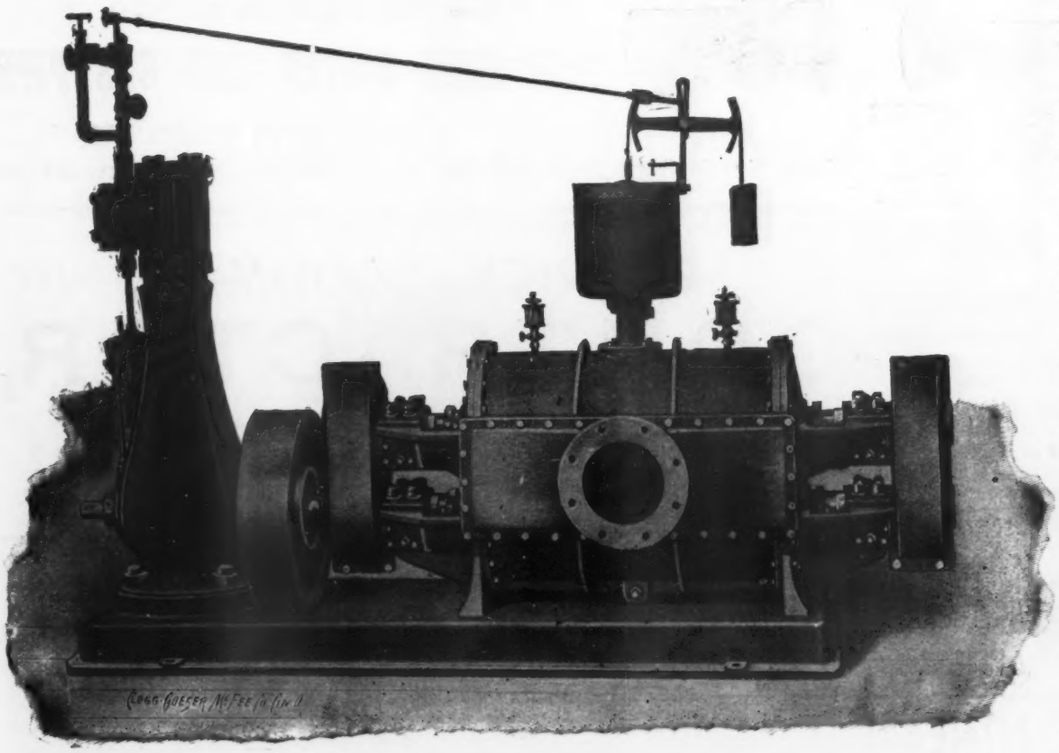

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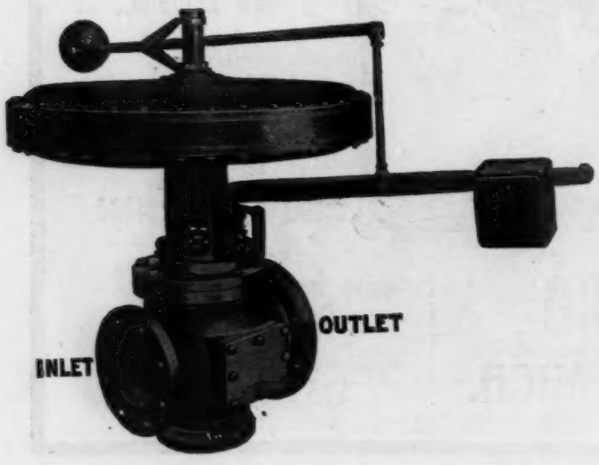

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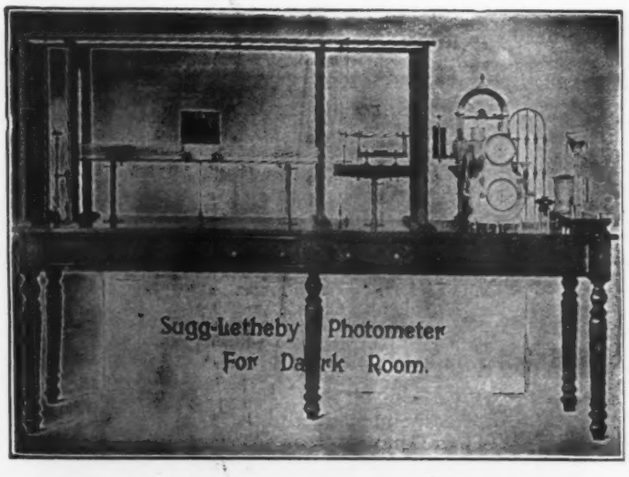
JULY, 1907.

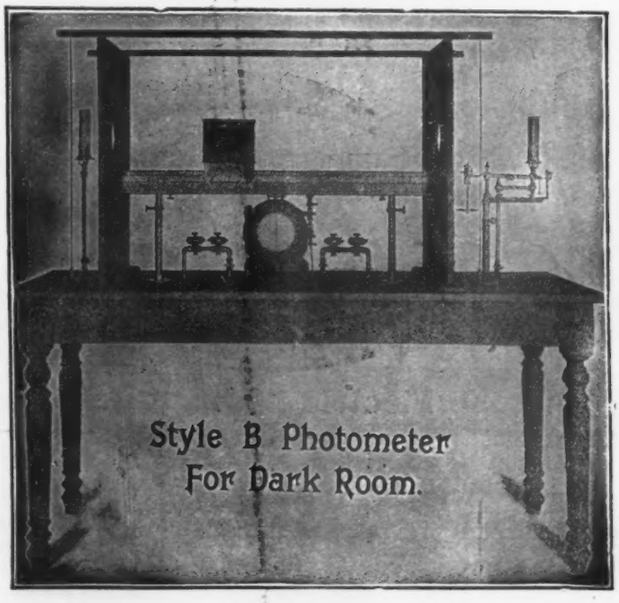
Day of Week.	Table No. 1. Following the Moon. Date.	Light.	Extinguish.
Mon.	1	8.00 PM	1.00 AM
Tue.	2	8.00 LQ	1.30
Wed.	3	8.00	1.50
Thu.	4	8.00	2.20
Fri.	5	8.00	2.50
Sat.	6	8.00	3.30
Sun.	7	8.00	3.40
Mon.	8	8.00	3.40
Tue.	9	8.00	3.40
Wed.	10	8.00 NM	3.40
Thu.	11	8.00	3.40
Fri.	12	8.00	3.40
Sat.	13	8.00	3.40
Sun	14	8.00	3.40
Mon.	15	9.30	3.40
Tue.	16	10.00	3.40
Wed.	17	10.30	3.40
Thu.	18	11.00 FQ	3.40
Fri.	19	11.40	3.40
Sat.	20	12.10 AM	3.40
Sun.	21	1.00	3.50
Mon.	22	2.00	3.50
Tue.	23	No L.	No L.
Wed.	24	No L FM	No L.
Thu.	25	No L.	No L.
Fri.	26	7.50 PM	9.40 PM
Sat.	27	7.50	10.20
Sun.	28	7.50	10.50
Mon.	29	7.50	11.30
Tue.	30	7.50	12.00
Wed.	31	7.50 LQ	12.20 AM

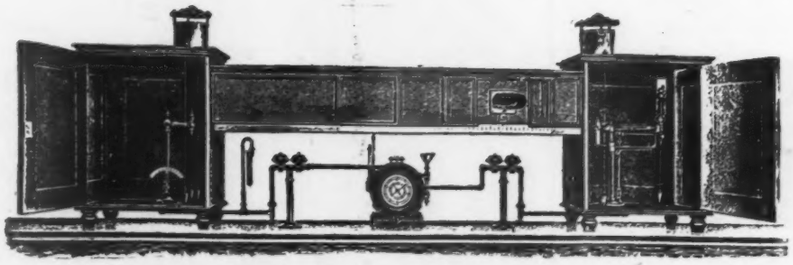
TOTAL HOURS DURING 1907.

By Table No. 1.

	Hrs.Min.
January	211.10
February	193.40
March	182.10
April	167.00
May	157.00
June	145.30
July	151.50
August	162.30
September	175.30
October	202.40
November	209.30
December	231.50
Total, yr.	2190.20







Closed Photometer For Light Room.

CIRCULARS SENT ON REQUEST.

PUBLIC LIGHTING TABLE.

JULY, 1907.

Day of Week.	Table No. 2. New York City. All Night Lighting. Date.	Light.	Extinguish.
		P. M.	A. M.
Mon.	1	7.30	3.15
Tue.	2	7.30	3.15
Wed.	3	7.30	3.15
Thu.	4	7.30	3.15
Fri.	5	7.30	3.15
Sat.	6	7.30	3.15
Sun.	7	7.30	3.15
Mon.	8	7.30	3.15
Tue.	9	7.30	3.15
Wed.	10	7.30	3.15
Thu.	11	7.30	3.15
Fri.	12	7.30	3.15
Sat.	13	7.30	3.15
Sun.	14	7.30	3.15
Mon.	15	7.30	3.15
Tue.	16	7.20	3.15
Wed.	17	7.20	3.15
Thu.	18	7.20	3.15
Fri.	19	7.20	3.15
Sat.	20	7.20	3.15
Sun.	21	7.20	3.15
Mon.	22	7.20	3.15
Tue.	23	7.20	3.15
Wed.	24	7.20	3.15
Thu.	25	7.20	3.15
Fri.	26	7.20	3.15
Sat.	27	7.20	3.15
Sun.	28	7.20	3.15
Mon.	29	7.20	3.15
Tue.	30	7.10	3.30
Wed.	31	7.10	3.30

TOTAL HOURS DURING 1907.

By Table No. 2.

	Hrs.Min.
January	423.20
February	355.25
March	355.35
April	298.50
May	264.50
June	234.25
July	243.45
August	280.25
September	321.15
October	374.30
November	401.40
December	433.45
Total, yr.	3987.45

NEW YORK, 318 West 42d Street. BOSTON, 820 Beacon Building. PHILADELPHIA, Broad and Arch Streets. ST. LOUIS, 712 Roe Building. CHICAGO, 218 La Salle Street. SAN FRANCISCO, 512 Oak Street.

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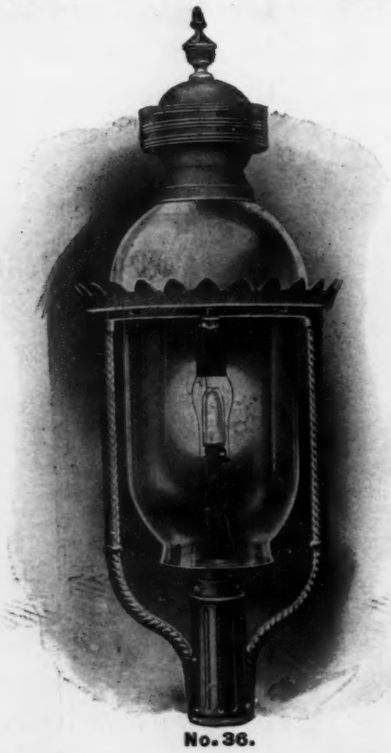
....OF AMERICA....



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Council Bluffs, Ia. (2d contract).
Seattle, Wash. (2d contract).
Philadelphia, Pa.
Waterbury, Conn.
Manchester, N. H.
Allentown, Pa.
Omaha, Neb.
Muskegon, Mich.
Nazareth, Pa. (2d contract).
Lewistown, Pa.
Greenville, Tex.
New York, Cent. Un. (3d contract).
Jefferson City, Mo.
Peekskill, N. Y. (2d contract).
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Washington, D. C. (4th contract).
Lawrence, Mass. (3d contract).
Hampton, Va.
Aurora, Ills. (2d contract).
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Syracuse, N. Y. (2d contract).
Davenport, Ia.
S. Brooklyn, N. Y. (3d contract).
Delray, Mich.
Albert Lea, Minn. (2d contract).
Leominster, Mass. (2d contract).
Clinton, Mass.

TOTAL SETS INSTALLED IN 1906, ... 41
TOTAL SETS TO DATE, ... 634
TOTAL DAILY CAPACITY, ... 502,555,000 cu. ft.

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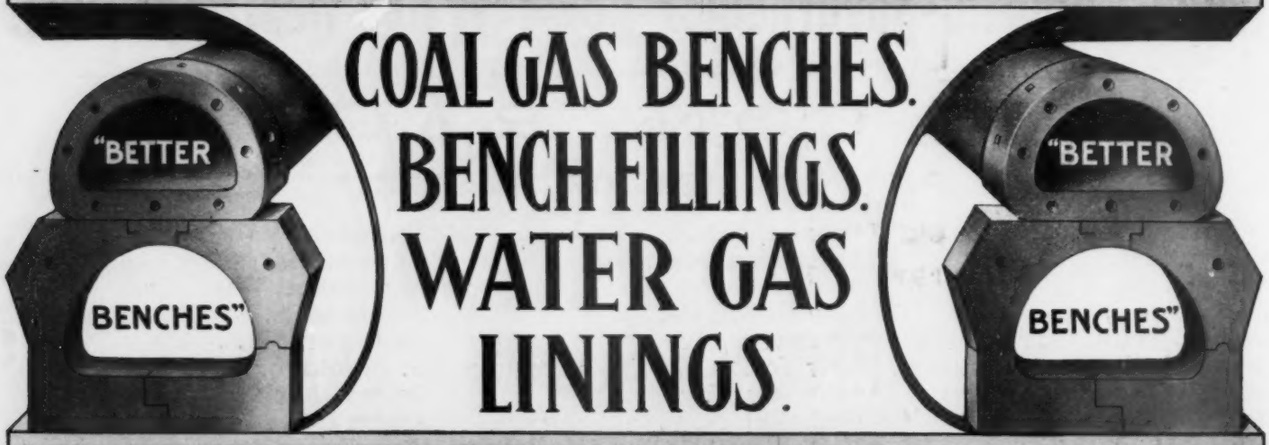

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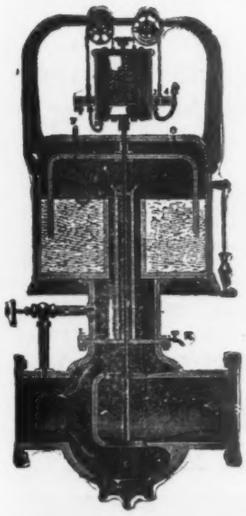

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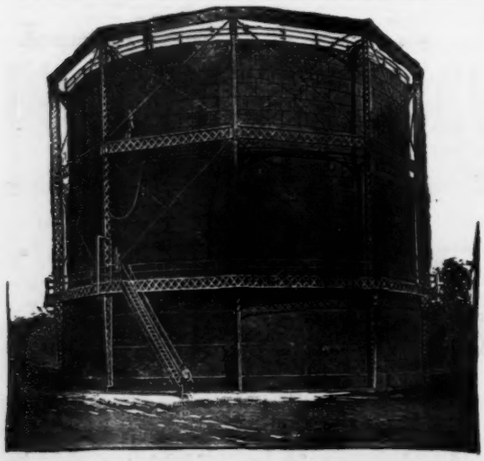

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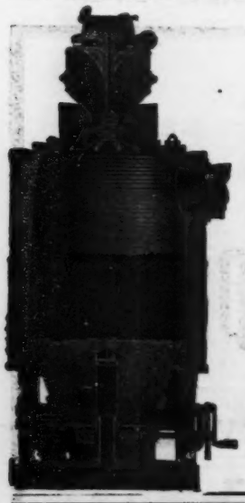

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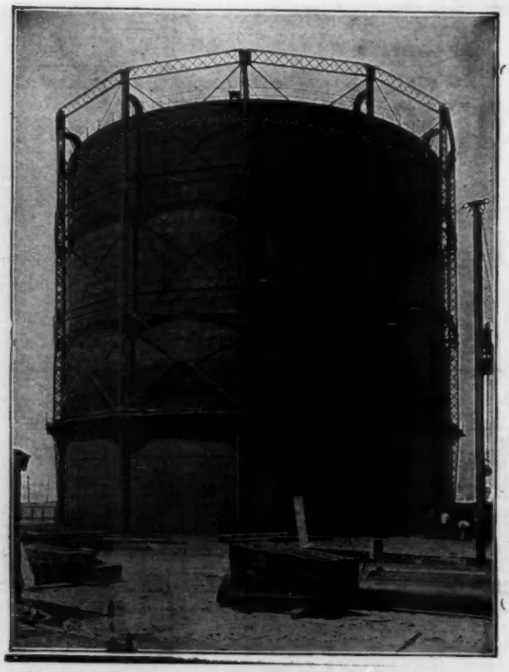

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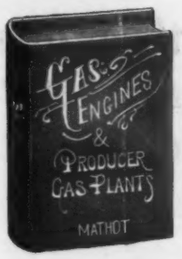

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